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INTRODUCTION

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Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbits and trajectories. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles. **3007**

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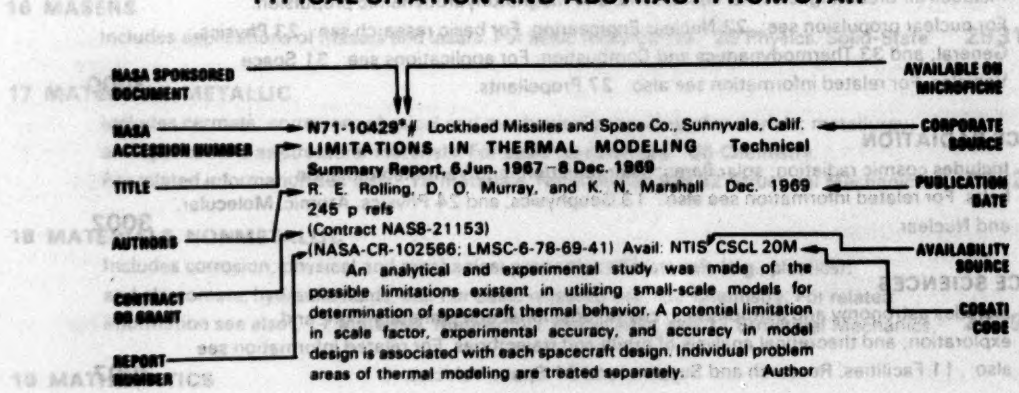
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An analytical and experimental study was made of the possible limitations existent in utilizing small-scale models for determination of spacecraft thermal behavior. A potential limitation in scale factor, experimental accuracy, and accuracy in model design is associated with each spacecraft design. Individual problem areas of thermal modeling are treated separately. Author
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VOLUME 9 NUMBER 18 / SEPTEMBER 23, 1971

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N71-30488*# Massachusetts Univ., Amherst. Dept. of Mechanical and Aerospace Engineering.

THE CALCULATION OF THE PRESSURE DISTRIBUTION ON A CASCADE OF THICK AIRFOILS BY MEANS OF FREDHOLM INTEGRAL EQUATIONS OF THE SECOND KIND

E. Martensen Washington NASA Jul. 1971 59 p refs Transl. into ENGLISH of the publ. 'Die Berechnung der Druckverteilung an Dicken Gitterprofilen mit Hilfe von Fredholmschen Integralgleichungen Zweiter Art' Goettingen, Max-Planck-Inst. fuer Stroemungsforschung und der Aerodyn. Versuchsanstalt, 1959 Sponsored by NASA

(NASA-TT-F-702; Rept-23) Avail: NTIS CSCL 01A

Two independent linear integral equations of the second kind with continuous kernels are derived for the exact potential theory for the velocity distribution on a cascade of thick airfoils. It is shown that the corresponding homogeneous integral equations possess one and only one nontrivial solution, so that one knows the general results on the basis of the Fredholm theorems. In the limiting case of infinite separation between airfoils the equations reduce to the familiar expressions for single airfoils. In the light of the periodicity properties which are present, one may develop a numerical calculation technique based on the solution from a system of linear equations. By selecting an adequately large number of unknowns, the desired accuracy is obtained. Examples are shown correlating the theory with an exact known solution and with measurements. Author

N71-30530*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF SUBSONIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF SLENDER SHARP EDGE 74 DEG SWEPT WINGS

Edwin E. Davenport and Jarrett K. Huffman Washington Jul. 1971 48 p refs

(NASA-TN-D-6344; L-7599) Avail: NTIS CSCL 01A

Slender sharp-edge wings having leading-edge sweep angles of 74 deg were studied at Mach numbers from 0.2 to 0.8. The wings had arrow, delta, and diamond planforms and were tested at angles of attack from −4 deg to 30 deg and angles of sideslip from −8 deg to 8 deg. The study consisted of wind-tunnel tests in the Langley high-speed 7- by 10-foot tunnel. Author

N71-30656*# Techtran Corp., Glen Burnie, Md.

DETERMINATION OF THE AERODYNAMIC CHARACTERISTICS OF AN ELASTIC SWEPT WING IN SUBSONIC FLOW [OPREDELENIYE AERODINAMICHESKIKH KHARAKTERISTIK UPRUGOGO STRELOVIDNOGO KRYLA V DOZVUKOVOM POTOKE]

A. Kh. Karimov Washington NASA Jul. 1971 15 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Aviats. Tekhn. (USSR), v. 13, no. 3, 1970 p 5–13

(Contract NASw-2037)

(NASA-TT-F-13717) Avail: NTIS CSCL 01A

The aerodynamic forces are calculated and the equations derived for an elastic wing of an aircraft in steady subsonic flow with a given overload, weight, and dynamic head. The calculations are made by a method, which is not only more accurate than the lifting line and lifting zone theories, and the sequential approximation method, but also provides for determination of the pressure centers for arbitrary wing deformations in addition to the lift. It is also more convenient than the sequential approximation in that it obviates the necessity of computing the deformation-produced forces at each stage of the calculation, as well as the need to apply special measures to improve the convergence of the sequential approximation process. Author

N71-30669*# General Electric Co., Cincinnati, Ohio.

INVESTIGATION OF A HIGHLY LOADED MULTISTAGE FAN DRIVEN TURBINE

D. C. Evans Washington NASA Jul. 1971 34 p

(Contract NAS3-14304)

(NASA-CR-1862) Avail: NTIS CSCL 20D

The results of a vector diagram study are presented. The effect of flowpath configuration, stage leaving swirl, work gradients, nonconstant work, stage energy split, and streamline slope and curvature were investigated. Based on these studies a particular type of vector diagram calculation was selected for the turbine design. Author

N71-30748*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AERODYNAMIC AND DEPLOYMENT CHARACTERISTICS OF MULTISTAGE CANOPY AND SUSPENSION-LINE REEFING SYSTEMS FOR A TWIN-KEEL ALL-FLEXIBLE PARAWING

Harry L. Morgan, Jr. and Austin D. McHatton Washington Jul. 1971 60 p refs

(NASA-TN-D-6306; L-7567) Avail: NTIS CSCL 01B

An investigation was conducted to determine the aerodynamic and deployment characteristics of a twin-keel all-flexible parawing rigged with several variations of a multistage canopy and suspension-line reefing system. Each variation consisted of four stages of suspension-line reefing with or without some form of canopy reefing during the first stage. A theoretical analysis was

made initially to determine design values for the resultant-force coefficient and the lift-drag ratio which would prevent the peak deployment load from exceeding a 3g design limit during each stage of the deployment sequence. Experimental aerodynamic data were obtained from wind-tunnel tests of 9.29 sq m (100 sq ft) wings rigged with various amounts of canopy and suspension-line reefing. Several reefing systems were then selected which had experimental values for the resultant-force coefficient and the lift-drag ratio as close as possible to the design values for each stage. Several 37.16-sq m (400-sq ft) wings were rigged with the selected reefing systems and flight-tested to determine their deployment characteristics. The results of the wind-tunnel and flight tests are presented, and detailed descriptions of the canopy and suspension-line reefing techniques, the wind-tunnel tests, and the method used to calculate the theoretical time-history of the deployment load are included as appendixes. Author

N71-30764*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PROGRESS REPORT ON WING-TRAILING-VORTEX STUDIES

R. Earl Dunham, Jr., Harry A. Verstynen, Jr., and Margaret S. Benner *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 101–113 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01A

The effect of wing-tip vortex wakes generated by large jet transport aircraft on smaller airplanes was investigated by determining the wake location relative to the generating aircraft and the strength of the vortex at points along the wake trail. The generating aircraft were a B-52, C-5A, DC-9, and a Convair 990. The gross weight varied from 78,000 lb to 600,000 lb, and the airplanes were flown in either clean, or landing approach configurations. The results indicate: (1) At holding or landing-approach speeds, the average vertical downwash path of the vortex can extend 750 ft to 1000 ft below the flight level of the generating airplane, at a range of 10 n. mi. (2) The wake strength and dissipation are predominately influenced by the generating-airplane weight and configuration. (3) The strongest wake turbulence was noted when the generating airplane was in the clean configuration. (4) The resulting upsets experienced by smaller airplanes indicate a need for a more conservative airway spacing criteria. F.O.S.

N71-30765*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

AIRCRAFT RESPONSE TO THE WING TRAILING VORTICES GENERATED BY LARGE JET TRANSPORTS

William H. Andrews, Glenn H. Robinson, and Richard R. Larson *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 115–126 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A flight-test program to evaluate the effect of the wing-tip vortex wake generated by large jet transport airplanes on a variety of smaller airplanes is reported. The resulting flight investigation was designed to obtain data essential to the determination of the wing-wake location relative to the generating aircraft and the apparent strength and dissipation of the vortex at a specified point along the wake trail. An additional objective of the investigation was to evaluate the upset potential and subsequent recovery capability of a variety of airplanes penetrating the vortex system. Author

N71-30769*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATION OF ADVANCED AERODYNAMICS TO FUTURE TRANSPORT AIRCRAFT

Albert L. Braslow and Theodore G. Ayers *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 165–176 (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01A

An attempt is made to apply supercritical airfoils to transport aircraft. Flight tests were conducted using the F-8 aircraft. The tests were conducted to determine maneuverability, speed margins, off-design performance, problems associated with high lift and lateral control devices, and the sensitivity of the wing to contour variations associated with manufacturing processes and deformations of the wing under flight loads. E.H.W.

N71-30813*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECTS OF NOSE BLUNTNESS ON THE STATIC AERODYNAMIC CHARACTERISTICS OF A CRUCIFORM-WING MISSILE AT MACH NUMBERS 1.50 TO 2.86

Roger H. Fournier and M. Leroy Spearman Washington Jul. 1971 31 p refs

(NASA-TM-X-2289; L-7729) Avail: NTIS CSCL 01A

Three nose shapes (an ogive nose, a nose of intermediate bluntness, and a hemispherical nose) were tested at Mach numbers from 1.50 to 2.86. The model had delta wings with a leading edge sweep angle of 72 deg. The results are summarized in the form of various pertinent aerodynamic parameters as a function of Mach number. Although no detailed analysis of the results is made, a summary of results is useful in demonstrating the importance of variations in nose bluntness and should be useful in providing a source of systematic experimental data for future correlation with analytical techniques. A brief correlation was made between the theoretical and experimental values of axial-force coefficient at zero angle of attack only, and the agreement was reasonably good. Author

N71-30852*# Techtran Corp., Glen Burnie, Md.

LIFTING SURFACE THEORY FOR AN AIRPLANE WING WITH A JET FLAP [TRAGELAECHENTHEORIE FUER TRAGLUEGEL MIT STRAHLKLAPPEN]

A. Das Jul. 1971 88 p refs Transl. into ENGLISH from German report DFL-093

(Contract NASw-2037)

(NASA-TT-F-13714; DFL-093) Avail: NTIS CSCL 01A

A method for the calculation of the lift distribution for wings of finite span with jet flaps is given. The method is applicable for incompressible flow and is an extension of the lifting surface theory. It can also be applied to wings of arbitrary planform (e.g., swept wings and delta wings) with an arbitrary distribution of jet momentum along the span. The jet flap characteristics of the two-dimensional airfoil theory are included. In order to obtain an essential simplification of the problem, the two-dimensional vorticity distribution along the wing chord is approximated in such a way that the section-lift coefficient and the section-moment coefficient of the airfoil are the same as in the exact solution. The calculation of the lift distribution is carried out in the usual way in the lifting surface theory. The chordwise vortex distribution is determined at several spanwise sections both on the wing and in the jet sheet from which the lift and moment distribution along the wing span is obtained. Some numerical examples were calculated for a straight rectangular wing and a swept wing. The theoretical and experimental results are in very good agreement. Author

N71-30861*+ National Aeronautics and Space Administration. Washington, D.C.

AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY, SUPPLEMENT 3, FEBRUARY 1971

Mar. 1971 137 p refs

(NASA-SP-7037(03)) Avail: NTIS CSCL 01A

This special bibliography lists 454 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1971. Emphasis is placed on engineering and theoretical aspects for design, construction, and associated components, equipment and systems. Also included are entries on research and development in aeronautics and

aerodynamics and research and ground support for aeronautical vehicles. Author

N71-31107*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Environmental Sciences Div.
A COMPARISON BETWEEN PLANAR AND NONPLANAR FREE-FLIGHT DATA
P. Jaffe *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 1-8 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 01A

Results from a program designed to explore the difference between the planar and nonplanar dynamic stability coefficient, using a bi-planar wind tunnel, free flight system, are presented. Two widely different configurations, a blunt 60-deg half-angle cone and a sharp 10-deg half-angle cone were tested. The overall accuracy of the data was extremely high and firmly demonstrates the capability of the technique. Although no dramatic difference in the coefficients was apparent from the data, which was limited in number, they do suggest that there is a favorable increase in the coefficient as the motion becomes more nonplanar. Author

N71-31108*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Environmental Sciences Div.
AERODYNAMIC OF VEHICLES IN TUBES
D. W. Kurtz *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 9-16 (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 01A

A 21.5 m long, 5.3 cm diameter, vertically oriented aluminum tube utilizing gravity to propel test models is described. This tube is used to test and determine aerodynamic characteristics of models under conditions of high blockage. Some initial results on the drag and pressure signature of a traveling model are presented. J.A.M.

N71-31109*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Environmental Sciences Div.
AEROBRAKING OF HIGH-SPEED GROUND TRANSPORTATION VEHICLES
W. Marko *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 17-22 (See N71-31006 18-30)
Copyright. Avail: NTIS CSCL 01A

An aerodynamic testing program was initiated to perform initial investigations on the effectiveness of a series of aerodynamic brakes on a long cylindrical body. Preliminary results from a low subsonic wind tunnel test using three standard test techniques are discussed. A moving-model drop-wire facility was constructed, and initial testing is currently underway. This data, which more correctly simulates the viscous interactions of the model with the ground plane, are compared with the wind tunnel data and used to develop analytical prediction methods. Author

N71-31154*# Dynasciences Corp., Blue Bell, Pa. Scientific Systems Div.
A DESIGN SUMMARY OF STALL CHARACTERISTICS OF STRAIGHT WING AIRCRAFT
M. A. McVeigh and E. Kisielowski Washington NASA Jun. 1971 223 p refs
(Contract NAS1-6389)
(NASA-CR-1648; DCR-305) Avail: NTIS CSCL 01A

A method of wing design using lifting line theory was computerized and used to study the parameters which affect wing stall characteristics. The results of the study and the computer program are described. The effects of airfoil section variations, Reynolds number, aspect ratio, wing twist and taper ratio are presented in design chart form. Author

N71-31204 Illinois Inst. of Tech., Chicago.
FLOW-FIELD AND PERFORMANCE STUDY OF AN AUGMENTED RAM-WING VEHICLE CONCEPT
Imants Reba (Ph.D. Thesis) 1970 243 p
Avail: Univ. Microfilms Order No. 70-17255

An experimental investigation of a vehicular concept with potential for high speed ground transportation of the future is described. The investigation consists of two parts: (1) a study of flows in the gap between the model underside and the ground at static conditions and 2(a) wind-tunnel study to evaluate concept potential under dynamic conditions. The flow field studies, composed of flow visualization experiments and static and total pressure measurements, yielded information about the effects of underside contour, ground height, slit size and orientation on flow field behavior and static pressure recovery. Wind tunnel studies were conducted in the presence of a moving ground plane and at free-stream velocities of 80.5 and 111 feet per second. Integration of static pressures over the model surface yielded vertical and horizontal force components which in the presence of blowing were corrected for jet reaction. The augmented Ram-Wind Vehicle potential was evaluated using lift-to-drag ratio and specific speed parameters. Dissert. Abstr.

N71-31262*# Washington Univ., Seattle. Aerospace Research Lab.
HIGH REYNOLDS NUMBER FLOWS
David A. Russell Washington NASA Jul. 1971 23 p refs
(Grant NGL-48-002-057)
(NASA-CR-1838) Avail: NTIS CSCL 20D

Available test facilities fall short of producing the full-scale Reynolds numbers of modern flight vehicles by at least an order of magnitude. A conventional facility that would meet the growing need for full simulation would be prohibitively expensive; thus quasi-steady devices should be considered. The design of these devices, their capabilities and limitations, and their use in identifying and studying flows sensitive to the Reynolds number are discussed. Author

N71-31459# Advisory Group for Aerospace Research and Development, Paris (France).
TECHNICAL EVALUATION REPORT ON AGARD SPECIALISTS' MEETING ON AERODYNAMIC INTERFERENCE
David J. Peake May 1971 18 p refs Conf. held at Silver Spring, Md., 28-30 Nov. 1970
(AGARD-AR-34-71) Avail: NTIS

A critique of topics discussed at the AGARD meeting on aerodynamic interference is presented. Discussions evaluated include: wing-body and wing-body-tail interference, airframe-propulsion interactions, and airframes-stores interference. The major advance is considered to be the treatment of a lifting wing-body combination in which a sheet of trailing vorticity from a wing was coupled with the finite element method. It is recommended that a calibration model of a wing-body combination be chosen for checking various computation schemes, and some high Reynolds number wind tunnel tests be conducted to provide details of the junction pressure distributions and the three-dimensional boundary layers and wakes. F.O.S.

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of composite aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N71-30608*# National Aeronautics and Space Administration, Washington, D.C.
JOINT DOT-NASA CIVIL AVIATION RESEARCH AND

DEVELOPMENT POLICY STUDY: REPORT
Mar. 1971 104 p refs Prepared in cooperation with Dept. of Transportation
(NASA-SP-265; DOT-TST-10-4) Avail: NTIS CSCL 01B

Analyses of such varied subjects as long- and short-haul passenger service air cargo, general aviation, air vehicles, air traffic control, airports, complementary surface transportation, financial considerations, institutional and environmental factors, foreign competition, military contributions to civil aviation benefits, and several key policy issues are presented. Author

N71-30507*# National Aeronautics and Space Administration, Washington, D.C.
JOINT DOT-NASA CIVIL AVIATION RESEARCH AND DEVELOPMENT POLICY STUDY: SUPPORTING PAPERS
Mar. 1971 248 p refs Prepared in cooperation with Dept. of Transportation
(NASA-SP-266; DOT-TSY-10-5) Avail: NTIS CSCL 01B

A variety of subjects, some technical- which relate directly to civil aviation research and development - and some nontechnical - which affect the climate for technical innovation in the civil aviation industry and therefore determine whether the results of research and development will find application in the future are discussed. The specific missions performed by civil aviation and the four system elements of each of these missions are presented. Each technical section is based on analyses of the characteristics and growth to date, current problems, future requirements (demand for service), potential solutions, implication for R&D, and recommendations. Author

N71-30517 Civil Aeronautics Board, Washington, D.C.
REMARKS PREPARED FOR DELIVERY BY THE HONORABLE SECOR D. BROWNE, CHAIRMAN, CIVIL AERONAUTICS BOARD BEFORE THE AIRLINE FINANCE AND ACCOUNTING CONFERENCE
Secor D. Browne [1970] 5 p Conf. held in New Orleans, 2 Nov. 1970
Avail: NTIS

The comments of the chairman of the Civil Aeronautics Board to the conference of airline financial executives are presented. The need for clear two-way communication between the board and the airlines was stressed along with the importance of budgeting and cost control. F.O.S.

N71-30675# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
INDIVIDUAL FLIGHT PROGRAM TESTS OF NOTCHED CANTILEVER BEAMS FOR PRELIMINARY DESIGN OF WING ATTACHMENT OF VFW 614 [EINZELFLUGVERSUCHE AN KERBSTAEBEN ZUR VORDIMENSIONIERUNG DES FLUEGELWURZELBEREICHES DER VFW 614]
D. Schuetz 1970 22 p refs In GERMAN; ENGLISH summary Sponsored by Ver. Flugtech. Werke
(TB-89) Avail: NTIS

A flat plate cut from sheet metal was subjected to load programs on a testing machine, thus simulating in-flight stress on wing root structural members. The load program and the actual testing are described. ESRO

N71-30718*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
EVALUATION OF EFFECTS OF HIGH-ALTITUDE TURBULENCE ENCOUNTERS ON THE XB-70 AIRPLANE
Ronald J. Wilson, Betty J. Love, and Richard R. Larson Washington Jul. 1971 85 p refs
(NASA-TN-D-6457; H-631) Avail: NTIS CSCL 01B

A turbulence response investigation was conducted with the XB-70 airplane. No special turbulence penetration techniques, speeds, or other restrictions were specified for the investigation, nor were any flights made solely to obtain turbulence data. During 79 flights, turbulence was encountered, and recorded on a VGH recorder, 6.2 percent of the total flight distance at supersonic speeds above an altitude of 12,192 meters (40,000 feet). Geographical locations are given for selected turbulence encounters. For 22 flights the airplane was instrumented to measure true gust velocities and the structural acceleration response to turbulence. The turbulence intensities measured were very low in comparison with those measured at high altitudes in other investigations. Acceleration response spectra, frequency response transfer functions, and coherence functions 0.88, 1.59, and 2.35. Results are compared with calculated studies. Frequencies from the vertical and lateral structural modes, dominant in the airplane acceleration responses, were compared with the natural frequencies of the human body in the vertical and lateral directions. Author

N71-30756*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
NASA AIRCRAFT SAFETY AND OPERATING PROBLEMS, VOLUME 1 Conference Proceedings
Washington 1971 444 p refs Conf. held at Langley Sta., Va., 4–6 May 1971
(NASA-SP-270) Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Conference papers are presented on flight safety, airway and runway environments, subsonic cruise aircraft, cockpit environment, terminal area operations, flight environment, and induced environmental effects. For individual titles, see N71-30757 through N71-30787.

N71-30757*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FACTORS AFFECTING DITCHING OF NEW TRANSPORT AIRPLANES
Lloyd J. Fisher *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 1–10 (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Investigations of aircraft ditchings using dynamic models of the C-5 aircraft are discussed. The behavior of the model with wheels up or down, and the fuselage damage during ditching are described. The major factors affecting ditching are considered to be: bottom damage, landing attitude, flap setting, gear position, wave heading, floor strength, and wing location. It is concluded that ditching safety can be increased by designing suitable floor structures and by wing location. F.O.S.

N71-30758*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDY OF PROTECTION OF PASSENGERS IN AIRCRAFT CRASH FIRES
Carr B. Neel and Richard H. Fish *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 11–31 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A method for surrounding the passenger compartment with a fire-retardant shell was studied to protect the occupants long enough for a fire to burn out, or for fire fighting equipment to extinguish the fire. A lightweight foam plastic called polyisocyanurate foam, and an intumescent paint which expands to many times its original thickness was tested using an aircraft fuselage in a jet-fuel fire. The tests showed that in the protected portion of the cabin, the air temperature changed very little for the first six minutes; when the heat penetrated, the temperature rose to 150 C in 12 minutes. It is concluded that problems such as protecting the fuselage against rupture, and providing protection for windows must be solved before this type system can be used for passenger protection. F.O.S.

N71-30759*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
IMPROVEMENT OF FIRE SAFETY IN AIRCRAFT
Mathew I. Radnofsky *In its* NASA Aircraft Safety and Operating

Probl., Vol. 1 1971 p 33–47 (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Nonflammable and fire-resistant materials used within spacecraft were evaluated for applicability to commercial aircraft refurbishment. Durability and esthetic qualities of fiberous, celluosic, elastomeric, and composite materials were considered for commercial aircraft items including curtains, upholstery, carpets, decorative panels, cabinets, paper products, oxygen lines, and straps. Two T-39 and one NASA Gulfstream aircraft refurbishment programs applying the technological advances are outlined. J.M.

N71-30760*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A CONTINUOUS WAVE DOPPLER SYSTEM FOR AIRCRAFT COLLISION HAZARD WARNING

Richard H. Couch and Charles L. Britt (Res. Triangle Inst.) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 49–59 (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A low-cost pilot warning indicator (PWI) suitable for use in commercial and general aviation is being developed for warning pilots of an impending midair collision hazard. General studies were conducted to compare alarm performance of various ideal systems having different warning criteria. From the studies, it was determined that the required measurements were relative range, closing velocity, and altitude difference. The PWI consists of a transceiver and display unit onboard the protected aircraft and a linear transponder on the intruding aircraft. It is concluded that the system has the capability of handling a large number of aircraft without saturation. F.O.S.

N71-30761*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LIGHTNING INDUCED VOLTAGES IN AIRCRAFT ELECTRICAL CIRCUITS

Paul T. Hacker *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 61–73 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A study was conducted to determine the magnitude of induced voltages and their relation to the characteristics of the lightning discharge and to the physical and electrical characteristic of the aircraft and its electrical systems. The investigation was performed with a wing of an F-89 airplane and a simulated lightning facility. The induced voltages measured for some circuits and simulated lightning characteristics were of sufficient magnitude to adversely affect sensitive avionics. Author

N71-30762*# National Aeronautics and Space Administration. Lewis Research Flight Center, Cleveland, Ohio.

STATUS OF ENGINE ROTOR BURST PROTECTION PROGRAM FOR AIRCRAFT

Patrick T. Chiarito *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 75–88 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

The status of the experimental research program to develop criteria for the design of devices to protect aircraft from rotor fragments is presented. Test rotors were intentionally failed and generated fragments which impacted containment/deflection devices. High-speed photographs recorded the complex interactions for subsequent analysis. Test results indicate that the capability of a ring to contain rotor fragments depends upon the number of fragments as well as the mechanical properties of the structural material. Both metals and nonmetals show good potential. It was demonstrated that partial rings can deflect fragments away from areas to be protected. A computer program was developed which predicts the ring deformation if the forces applied by the fragments are known. Another program uses measured ring deflections to calculate the applied forces. These forces are subsequently used to calculate ring deflections. Predicted and measured ring profiles are in reasonable agreement for single-rotor-blade impacts of freely supported rings. Author

N71-30768*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECTS OF AIRPLANE OPERATIONS ON TIRE WEAR

John L. McCarty and Upshur T. Joyner *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 153–163 (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Tire wear studies were undertaken to explore chevron cutting damage resulting from airplane touchdown on grooved runways and to examine the wear attributed to airplane braking operations. Preliminary results show chevron cutting occurs at the spot on the tire which initially contacts the surface and the damage is the result of the scrubbing action of the tire as it skids over the grooves prior to any rotation. The cutting is shown to occur only in large tires requiring a large force to induce rotation. Results also indicate that the cutting is essentially independent of grooving patterns on runways but strongly dependent upon the nature of the surface finish. It was shown that tire tread pattern and/or rubber composition also affect the extent of cutting. Tire measurements made during braking indicate the economic advantage of an airplane brake control system capable of limiting the wheel slip ratio. It was suggested that tire wear is unaffected by runway grooving. Author

N71-30770*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FLIGHT EVALUATION OF A DISPLAY FOR STEEP APPROACH

R. Earl Dunham, Jr., Jack J. Hatfield, Henry C. Elkins, and Richard H. Sawyer *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 177–187 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Results from an investigation of a display concept designed to alleviate the problems of inadequate guidance and display information for making steep approaches, are given. The 6 degree/3 degree two segment glide slope and commercial military, research, and lear jet aircraft were used in the investigations. Conclusions indicate the vertical situation display concept shows promise. The concept also shows better flight and airspeed control and power management than with a conventional cross painter indicator. The improved guidance and situation information provided by the display system allows more freedom in flight path management and cuts down on the work function. E.H.W.

N71-30771*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

HANDLING QUALITIES OF LIGHT AIRCRAFT WITH ADVANCED CONTROL SYSTEMS AND DISPLAYS

Paul C. Loschke, Marvin R. Barber, Calvin R. Jarvis, and Einar K. Enevoldson *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 189–206 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Flight tests to determine the benefits of advanced control systems and displays on the handling qualities of general aviation aircraft, primarily during ILS (Instrument landing system) approaches in turbulence, have shown that very significant benefits can be achieved. The use of a flight director display and an attitude command control system in combination was shown to transform a typical light aircraft into a flying machine that borders on being perfect from a handling qualities standpoint during ILS approaches in turbulent air. The singular use of either the flight director display or the attitude-command control system provided significant benefits. A rate command control system was found to provide significantly less benefit than an attitude command control system. The command control systems tested tended to improve the poststall response of the basic aircraft, but degraded its stall warning characteristics. The control systems improved the response of the aircraft to sudden engine failures. Author

N71-30773*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SAFETY CONSIDERATIONS AND POWERED-LIFT STOL AIRCRAFT

Curt A. Holzhauser and Robert C. Innis *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 221–231 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Methods for developing powered lift in commercial STOL aircraft are given. To use powered lift it is necessary that airworthiness conditions account for the propulsion system contribution to lift and control. Changes are needed for these conditions to assess the consequences of propulsion system failures during the approach mode. E.H.W.

N71-30774*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

OPERATIONAL ASPECTS OF V/STOL INSTRUMENT APPROACHES

Lee H. Pearson, Jr., Samuel A. Morello, Curt A. Holzhauser (NASA. Ames Res. Center), and Ronald M. Gerdes (NASA. Ames Res. Center) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 233–247 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Terminal area studies using various V/STOL configurations were made to develop an operational technique for managing powered lift during simulated precision approaches from cruise to landing. The results of these studies are integrated into a realistic appraisal of V/STOL instrument approach techniques. The configurations evaluated are discussed including the powered-lift concepts they represent and the powered-lift controls available to the pilot. The mechanics of a generalized powered-lift concept relative to an approach glide path are investigated and the operational aspects of powered lift are discussed with regard to stabilization requirements, conversion maneuver, glide-path control, and velocity control or deceleration schedule on the approach. The four aircraft studied include the Kestrel (a vectored jet), the XV-5B (a fan in wing), the XC-142A (a tiltwing), and the Do-31 (a mixed-propulsion jet), and represent fundamentally different V/STOL concepts. A brief description of the powered-lift system in each aircraft and the controls available to the pilot for managing the systems is presented. Author

N71-30775*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ANALYSIS OF SOME HELICOPTER OPERATING PROBLEMS

Charles E. K. Morris, Jr., John F. Ward, Julian L. Jenkins, Jr., and William J. Snyder *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 249–261 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Results of analyses and experimental studies of some helicopter operating conditions are outlined. Low-speed directional-control limitations, rotor oscillatory leads in maneuvers, maneuver lift sharing of compound helicopters, and fuselage vibration and passive isolation problems are discussed along with possible solutions. J.M.

N71-30777*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SIMULATION STUDIES FOR DEVELOPMENT OF CERTIFICATION CRITERIA APPLICABLE TO SST TAKEOFF

C. Thomas Snyder, Richard S. Bray, Fred J. Drinkwater, III, and Raymond D. Forrest (FAA) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 277–290 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A variety of airplane configurations were utilized in the test program. Nearly 2000 take-offs and 800 landings were made. Engine failure take-off testing of high-induced-drag SST designs confirmed the need for more stringent take-off-speed requirements. However, these tests demonstrated that proposed requirements intended to provide the additional protection, were overconservative and economically penalizing. New minimum requirements were defined and agreed upon during joint testing by British, French, and U.S. airworthiness authorities. During surprise refused take-offs, the sequence of application of deceleration devices (throttles, brakes, and spoilers) was found to differ from that commonly assumed in the certification process of determining the accelerate-stop distance and has the effect of increasing the stopping distance. The effects of this difference could be amplified for SST airplanes. E.M.C.

N71-30779*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

RADIATION SAFETY IN HIGH-ALTITUDE AIRPLANE TRAFFIC

Trutz Foelsche *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 307–321 refs (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A brief survey of results up to 1970 of an experimental and theoretical study of biologically important radiation components and dose equivalents due to galactic and solar cosmic rays in the high atmosphere, especially at supersonic transport (SST) altitudes, is presented. The dose equivalent rate for the flight personnel flying 500 hours per year at cruise altitudes of 18.2 to 19.8 km (60,000 to 65,000 ft) in high magnetic latitudes turned out to be about 0.75 to 1.0 rem/yr averaged over the solar cycle. This rate is about 15 to 20 percent of the maximum permissible dose (MPD) rate for radiation workers (5 rem/yr), as established by the International Commission on Radiological Protection (ICRP) for peacetime operations. The suggested evasion measure of descending to lower altitudes is therefore sufficient to avoid overexposure of passengers in such rare cases. Proposed systems of inflight radiation warning and monitoring are briefly discussed. Author

N71-30780*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PRELIMINARY STUDY OF AIRPLANE-AUTOPILOT RESPONSE TO ATMOSPHERIC TURBULENCE

Waldo I. Oehman *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 323–334 (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

A preliminary study was made to determine how the response of a particular airplane to atmospheric turbulence would be affected by automatic controls operating in altitude-hold and attitude-hold modes. The calculations show that excursions of the response variables from their equilibrium values may be reduced by these relatively simple controls. The calculations also show that excursions in the augmented airplane altitude and normal acceleration, caused by response to atmospheric turbulence, may lead to buffeting and passenger discomfort. In order to obtain the most desirable response, the control systems should be more complex than those considered. Author

N71-30781*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PRELIMINARY STUDY OF EFFECT OF VIBRATION ON AIRCRAFT RIDE QUALITY

Sherman A. Clevenson, William J. Snyder, and John J. Catherines *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 335–345 (See N71-30756 18-02)

Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Difficulty in developing aircraft ride criteria and/or acceptable vibration levels and problems in measuring and recording the relatively low-level vibration environment associated with passenger vehicles in the low-frequency (0 to 30 Hz) regime are considered. The portable, self-contained measuring/recording system used for this low-frequency range is described. In addition, examples of real-time data, peak accelerations, and statistical vibration results are given. The results of controlling the environmental input to a helicopter pilot are also shown. Author

N71-30782*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PROGRESS REPORT ON THE NASA V-G/VGH GENERAL AVIATION PROGRAM
Joseph W. Jewel, Jr. *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 347–390 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

An analysis is presented of 79,000 hours of data obtained from NASA V-G and VGH flight recorders installed on 134 general aviation aircraft engaged in eight types of operations. Information is presented on typical mission characteristics, on airspeed practices, on gust accelerations and derived gust velocities encountered, on maneuver-acceleration experience, and on the initial positive landing-impact accelerations. Comparisons are also made of the actual gust and maneuver loads experienced with the design gust and maneuver loads. Author

N71-30784*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROGRESS IN REDUCING EXHAUST POLLUTANTS FROM JET AIRCRAFT
Helmut F. Butze and Jack Grobman *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 403–416 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Substantial reductions in hydrocarbons and carbon monoxide emissions during idling were realized with air-assist fuel nozzles in jet aircraft exhaust pollutants tests. Under simulated take-off conditions, emissions of nitrogen oxides from the short-length combustor amounted to only about 10 percent of those from the longer commercial combustors. These results strongly point out that in order to reduce pollutant emissions at all aircraft operating conditions, a number of compromises or trade-offs are necessary. For efficient combustion during idling and for good altitude (relight capability), fuel-rich primary zones are required. Fuel-rich primary zones, however, lead to excessive smoke formation and possibly high concentrations of nitric oxide. Reductions in nitrogen oxides can be brought about by reducing the resistence time in the combustor primary zone, or designing the combustor with a fuel-lean primary zone to reduce smoke formation and as short as possible from the standpoint of combustor-exit temperature distribution. E.M.C.

N71-30785*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRENDS IN NOISE CONTROL FOR AIRCRAFT GAS-TURBINE POWER PLANTS
David Chestnutt, Harvey H. Hubbard, and Charles E. Feiler (NASA. Lewis Res. Center) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 417–427 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

An attempt was made to identify the main sources of noise in various types of gas-turbine power plants and to indicate the state-of-the-art in noise reduction. Useful trends in design and operation are summarized for such noise sources as jet exhausts, fans, high-lift devices, and unducted rotors. A significant result is that lower noise levels generally are associated with lower velocities and lower pressure ratios. Author

N71-30786*# National Aeronautics and Space Administration. Langley Reserchcenter, Langley Station, Va.
EVALUATION OF MEASURES OF AIRCRAFT NOISE
Philip M. Edge, Jr., Randall M. Chambers, and Harvey H. Hubbard *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 429–437 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

The development of measurement units to properly represent human responses to aircraft noise is reported. Accurate units for use in the systematic design of quieter aircraft to meet noise specifications and in various aspects of aircraft noise certification are discussed. Units which are simple in concept and easy to use in connection with the prediction of community annoyance and complaint patterns, land use planning near airports, and airport traffic monitoring and control are included. The nature of the airport noise problem in communities near airports and the significant factors in noise-induced responses are indicated. The psychophysiological characteristics of people which are significant in their responses to noise are summarized as well as the physical characteristics of the aircraft noise stimuli. The nature of the airport traffic, including the use of preferential runways, the mix of aircraft types, and flight scheduling; and community environment considerations, including background noise levels, economic factors, and types of community activities are covered. Author

N71-30787*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATUS OF STUDIES IN SONIC BOOM
Domenic J. Maglieri, Harry L. Carlson, and Norman J. McLeod (NASA. Flight Res. Center) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 439–456 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 01B

Results are presented from experiments which update the existing information relative to supersonic operations and broaden the flight regimes to include operations at hypersonic speeds and low supersonic speeds. The significant factors which affect the sonic boom include airplane design, which involves weight, size, and volume and lift distributions; airplane operations, which involve altitude, Mach number, and flight path; and the atmosphere, which involves pressure, temperature, and wind gradients and turbulence. Discussions of the effects of each of these factors as they relate to the three operating regimes are presented. Author

N71-30800*# West Virginia Univ., Morgantown. Summer Predoctoral Fellowship Program in Engineering Systems Design.
FUTURE AIR TRAFFIC: A STUDY OF THE TERMINAL AREA
Richard E. Schmotzer, Albert N. Andry, Michael G. Harris, and Gerald F. Reid, eds. 1970 373 p refs
(Grant NGT-49-001-045)
(NASA-CR-119287) Avail: NTIS HC $6.00/MF $0.95 CSCL 01E

The processes involved in the systems design of terminal area air traffic control systems through the year 2000 are outlined. The demand and terminal area performance characteristics of aircraft were determined by looking at today's demand and types of aircraft and extrapolating the data to the year 2000. Air traffic control methods, takeoff and landing criteria, and air collision avoidance procedures and hardware were formulated to minimize, safely and economically, terminal area operation time for the year 2000. A simulation model was developed for terminal area operation for the present day system and for the future. The model permitted tradeoff studies such as new runways versus new airports or straight-in approaches versus curved approaches. Author

N71-30848*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STUDIES AND TESTS OF A PLANE WHICH ABSORBS STRONG WIND GUSTS [ETUDES ET ESSAIS D'UN AVION ABSORBEUR DE RAFALES]
Rene Hirsch Washington Jul. 1971 31 p refs Transl. into ENGLISH from Docaero (Paris), no. 42, Jan. 1957 p 13–28
(NASA-TT-F-13754) Avail: NTIS CSCL 01A

The problem of wind gust absorption by aircraft structures is discussed. Topics presented include: structure of atmospheric wind gusts, effects of wind gusts on the classic plane, general characteristics of the wind gust absorber, construction, and test flights of the prototype H-100. F.O.S.

N71-31081# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE PROBLEMS OF SQUALLS AT MACH 1 [DAS BOENPROBLEM BEI DER MACHZAHL 1]
I. Teipel 1970 4 p ref Transl. into ENGLISH from Z. Angew. Mech. (West Germany), v. 48, no. 8, 1968 p 246–247
Avail: NTIS

The stresses to which an aircraft is subjected in the transonic range are calculated; the basic problem is the extent to which linear equations are valid for the range of low frequencies. In case of less time accelerations the results approach those of the stationary nonlinear theory. In order to solve this problem an attempt is made to find an approximate solution of the nonlinear potential equation for the disturbed flow in the transonic range.
Author

N71-31084# National Aviation Facilities Experimental Center, Atlantic City, N.J.
DEVELOPMENT AND TEST OF THE EXPLOSIVE EXIT CONCEPT FOR CIVIL TRANSPORT AIRCRAFT Final Report, Jul. 1968–Oct. 1970
Joseph J. Jaglowski, Jr. July 1971 41 p ref
(FAA-RD-71-22; FAA-NA-71-11) Avail: NTIS

The test program was performed to evaluate the liquid explosive emergency exit system reliability, performance, and hazards to personal safety when exposed to environments which might be encountered before, during, and after a crash. The report includes: (1) a test program to evaluate the liquid explosive emergency exit system when exposed to environment simulating conditions encountered before, during, and after a crash; (2) results of the tests; (3) evaluation of retaining shield in attenuating the sound level and containment of the debris produced by the detonation of the linear shaped charge; and (4) the feasibility of adapting the liquid explosive emergency exit system for use on civil transport aircraft.
Author

N71-31085# Council for Scientific and Industrial Research, Pretoria (South Africa).
EFFECT OF ELASTICITY OF AN AIRCRAFT STRUCTURE ON THE DEFLECTION OF ELEVATOR CONTROL LEVER AND ON THE CONTROLLING FORCES DURING STABLE FLIGHTS [VLIV NETUHOSTI KONSTRUKCE LETOUNU NA VYCHYLKY RIDICI PAKY VYSKOVKY A NA RIDICI SILY V USTALENYCH LETECH]
Vladimir Tichopad 1969 40 p refs Transl. into ENGLISH from Zpravod. Vyzkumny a Zkusebni Letecky Ustav (Letnany), 1968 p 15–27
Avail: NTIS

General relations for the variation in the control lever deflection and controlling forces with flight speed, including the effect of aircraft compressibility and deformation, are deduced. The relations proposed here distinguish simply and clearly between the effects of deformation, Mach number and the simultaneous interaction of both, and determine such effects from the aerodynamic and rigidity characteristics of aircraft.
Author

N71-31078# Wyle Labs., Inc., Rockville, Md. Research Staff.
EFFECTIVE PERCEIVED NOISE LEVEL EVALUATED FOR STOL AND OTHER AIRCRAFT SOUNDS Final Report
B. D. Adcock and J. B. Ollerhead May 1970 117 p refs
(Contract FA-67-WA-1731)
(WR-70-9; FAA-NO-70-5) Avail: NTIS

A paired comparison experiment was conducted in which a group of thirty-two subjects evaluated, in a progressive wave field, the noisiness of sixty recorded aircraft flyover sounds. Thirty of these recordings were from short take-off and landing (STOL) aircraft. The complete set included a wide range of turbofan, turbojet, piston engine and turboprop powered aircraft in a variety of categories. The results were analyzed to test the ability of the Effective Perceived Noise Level (EPNL) and other scales to predict the subjective responses. Because the sample of aircraft sounds was unusually large in number, variety, dynamic range and duration, the test was considered to be severe. The main conclusion of the study is that the EPNL procedure performs as well for the STOL sounds as it does for the CTOL (conventional take-off and landing aircraft) sounds and may thus be used with equal confidence for rating the sounds of aircraft in both classes. When the sounds were divided into propulsion system categories it was found that EPNL, in common with other scales, performed most consistently for jets, piston engined aircraft and turboprops, in that order. In general, the integrated duration correction proved superior to an approximate correction based on the 10 dB-down duration. Analysis of the results showed that the average magnitude of the tone-correction was more than 3 db and that corrections were automatically applied in practically all cases. In the case of propeller aircraft sound it is apparent that low frequency harmonics require tone corrections, whereas the subjective results suggest they are not required. It is recommended that the automated procedures for tone identification need some revision but that in the meantime, EPNL may be improved by ignoring tones identified at frequencies less than about 500 Hz.
Author

N71-31086*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INLET NOISE SUPPRESSOR PERFORMANCE WITH A TURBOJET ENGINE AS THE NOISE SOURCE
John F. Groeneweg, Charles E. Feller, and Loren W. Acton Washington Jul. 1971 35 p refs
(NASA-TN-D-6395; E-6181) Avail: NTIS CSCL 20A

Inlet noise suppressors having a perforated plate over honeycomb wall construction were evaluated over a range of passage heights and engine speeds using a turbojet engine as a noise source. Measured sound power attenuation spectra were compared to values predicted by a combination duct propagation and wall impedance model. Noise floors existing in the experiment limited the maximum measurable attenuations to about 20 dB. The model predicted the frequencies at which peak attenuation occurs and the trends in attenuation magnitude within the limits imposed on the data by the noise floors. However, the measured attenuation bandwidths were usually substantially greater than predicted.
Author

N71-31242*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A METHOD FOR ESTIMATING SOME LONGITUDINAL AND LATERAL RIGID-BODY RESPONSES OF AIRPLANES TO CONTINUOUS ATMOSPHERIC TURBULENCE
Ellwood L. Peele Washington Aug. 1971 45 p refs
(NASA-TN-D-6273; L-7504) Avail: NTIS CSCL 01C

A method is presented for estimating some lateral and longitudinal rigid-body responses of airplanes to random atmospheric turbulence. Estimates of center-of-gravity load factors and motion responses can be made simply and easily through the use of parametric charts. Sample calculations are included to illustrate the method.
Author

N71-31263*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 4
Apr. 1971 113 p refs
(NASA-SP-7037(04)) Avail: NTIS CSCL 01B

This supplement to Aeronautical Engineering +A Special Bibliography (NASA SP-7037) lists 376 reports, journal articles, and other documents originally announced in March 1971 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). The coverage includes documents on the engineering and theoretical aspects of design, construction,

evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associate components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Author

N71-31288# Northrop Corp., Hawthorne, Calif. Aircraft Div.
AIRPLANE FLYING CHARACTERISTICS IN TURBULENCE Final Report, 1 Nov. 1969–11 Sep. 1970
Edward D. Onstott and Ernest P. Salmon Wright-Patterson AFB, Ohio AFFDL Feb. 1971 118 p refs
(Contract F33615-70-C-1156)
(AD-722855; NOR-70-139; AFFDL-TR-70-143) Avail: NTIS CSCL 5/10

A method for predicting the performance of the total pilot-vehicle system has been developed for the lateral dynamics of Class 4 airplanes. This method, which is based on pilot model theory and multiloop analysis, predicts tracking errors for command tracking tasks and also for attitude hold tracking tasks in turbulence. The predictions are in terms of root mean square time domain statistics and are obtained by means of a fully automated multiloop analysis performance prediction program available from the United States Air Force. Thus, system performance can be evaluated analytically in terms of familiar time domain root mean square statistics. The validity and accuracy of this method have been ascertained by means of moving base simulation on the Northrop Large-Amplitude Flight Simulator operating in five-degree-of-freedom motion. Author (GRA)

N71-31303*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEPLOYABLE AERODYNAMIC DECELARATION SYSTEMS: SPACE VEHICLE DESIGN CRITERIA
Washington, Jun. 1971 88 p refs
(NASA-SP-8066) Avail: NTIS CSCL 01B

Criteria and recommended practices are presented for the design, selection, analysis, and testing of deployable aerodynamic deceleration systems. Deployable devices of all types are treated, along with their usage over a wide range of environmental and operational conditions. The principal design factors relating to textile materials, dimensional stability, and fabrication processes are considered. Primary emphasis is given to the various types of parachutes, deployable wings, inflatable envelopes, and attached or towed surfaces on which the most experience has been accumulated. Lifting balloons and autorotors are also surveyed. Author

N71-31330*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATIC FORCE TESTS OF A MODEL OF A TWIN-JET FIGHTER AIRPLANE FOR ANGLES OF ATTACK FROM −10 DEG TO 110 DEG AND SIDESLIP ANGLES FROM −40 DEG TO 40 DEG
Ernie L. Anglin Washington Aug. 1971 90 p refs
(NASA-TN-D-6425; L-7808) Avail: NTIS CSCL 01B

An investigation was conducted to obtain a set of static-force-test data for use as aerodynamic inputs to theoretical spin studies. Control-effectiveness tests were made for each control individually and for a full left pro-spin combination of controls. The results are presented without detailed analysis, but are analyzed in terms of factors which would affect their applicability for use in spin theory. Several data characteristics are indicated that are deemed to be of significance with regard to their intended use in theoretical spin studies. Author

N71-31333# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: FEDERAL AVIATION ADMINISTRATION, DOUGLAS DC-3C, N7 LA GUARDIA AIRPORT, NEW YORK, 4 JANUARY 1971
3 Jun. 1971 12 p
(NTSB-AAR-71-11) Avail:

A Federal Aviation Administration DC-3 aircraft accident which occurred during landing at La Guardia airport, New York, on January 4, 1971 is reported. The accident investigation board determined that the cause of the accident was the pilot's failure to compensate for wind drift with atmospheric conditions as a mitigating circumstance. P.N.F.

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N71-30848*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR CELL DATA FROM THE RADIATION DAMAGE EXPERIMENT ON SATELLITE ATS-1
Ramond C. Waddel May 1971 298 p refs
(NASA-TM-X-65610; X-710-71-220) Avail: NTIS CSCL 10A

Results from the ATS-1 solar cell radiation damage experiment are presented in tabular and graphic forms. The numerical data give the coordinates of eight points on the voltage-current characteristic of each of 29 solar cells during 418 days in synchronous orbit. The cells were of various types, bearing shields of several kinds and thicknesses. Data are presented in both uncorrected and corrected forms. In the latter the irrelevant effects of varying illumination and temperature are removed. The apparatus, orbit, data processing, and conclusions are also briefly described. Author

N71-30827*# Pennsylvania Univ., Philadelphia. Electrochemistry Lab.
STUDIES IN FUNDAMENTAL CHEMISTRY OF FUEL CELL REACTIONS Quarterly Report, 1 Jan.–31 Mar. 1971
John O'M. Bockris 31 Mar. 1971 33 p refs
(Grant NGR-39-010-002)
(NASA-CR-119247; QR-9) Avail: NTIS CSCL 10A

A numerical evaluation was made of the solvent reorganization energy which according to the Levich theory is of prime importance in the oxygen-dissolution reaction. A method is outlined for the prevention of dendritic growth and of active surface decrease on zinc electrodes for silver batteries. J.M.

N71-30936*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation Lab.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. ACCEPTANCE TEST OF EAGLE PICHER INDUSTRIES, INC., 6.0 AMPERE-HOUR NICKEL-CADMIUM CELLS
D. E. Christy 1 Jun. 1971 21 p
(NASA Order W-2397)
(NASA-CR-119242; QE/C-71-188) Avail: NTIS CSCL 10A

The test results are presented for 20 secondary spacecraft cells rated at 6.0 ampere-hours and equipped with an auxiliary electrode for charge control purposes. The tests performed were for: capacity, cell short, overcharge, internal resistance, and leakage. F.O.S.

N71-31180*# Pratt and Whitney Aircraft, South Windsor, Conn. Engineering Facility.
THE EFFECT OF DESIGN AND OPERATING FACTORS ON LIFE AND PERFORMANCE OF MATRIX FUEL CELLS Final Report

K. O. Wood and W. F. Bell 28 Feb. 1971 100 p
(Contract NAS3-13229)
(NASA-CR-72906; PWA-4145) Avail: NTIS CSCL 10A

The effect of design and operating factors on the performance and life of alkaline electrolyte, hydrogen/oxygen, matrix fuel cells was investigated. Full size single cells were operated on a simulated space shuttle load profile and were refurbished by flushing with fresh electrolyte to extend their useful life. A data base for the design of fuel cells with a one year operating life is provided. Cell life of over 6400 hours at a potential of 0.945 volts with no net voltage decay was demonstrated while operating at a temperature of 176 F and a current density of 75 amps sq ft. Author

N71-31289# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
FEASIBILITY STUDY AND PRELIMINARY DESIGN FOR A 100 kW PERMANENT MAGNET GENERATOR Addendum to Final Technical Report, Oct. 1970 – Feb. 1971
Alan E. King, Carroll C. Kouba, and Jack L. McCabria Feb. 1971 210 p refs Supplement to AD-708930
(Contract DAAK02-69-C-0763)
(AD-722872; AD-708930-Add; WAED-71.02-E) Avail: NTIS CSCL 10/2

The feasibility of using recently developed permanent magnet materials for field excitation in a high speed generator was investigated and a preliminary design prepared. It was found that a design was feasible with only one of the permanent magnet materials - samarium cobalt (Sm Co5). Analyses were performed in the areas of electromagnetic design, mechanical design, rotor dynamics and in the thermal aspects of the permanent magnet generator (PMG). Preliminary design sketches and layouts are presented. Four potential problem areas were identified, but it was concluded that the PMG is feasible and that there is a high probability of its successful development. The added tasks covered by the addendum relate to analysis of the effects of harmonic mmfs, the test and evaluation of weld strengths and the selection and analysis of the bearings most suited to the PMG. Author (GRA)

N71-31498# ESB, Inc., Yardley, Pa.
BA540()AU WATER ACTIVATED 2-POUND ZINC AIR BATTERY Final Report, 17 Apr. 1970 – 16 Feb. 1971
Bernard Randall Apr. 1971 47 p
(Contract DAAB07-70-C-0157)
(AD-722802; ECOM-0157-F) Avail: NTIS CSCL 10/3

The report describes the work performed under contract No. DAAB07-70-C-0157 with the United States Army Electronics Command. Under this none-month contract ESB Incorporated fabricated to fabricate 42 BA-540( )/U two-pound zinc air water activated batteries. The batteries were fabricated and tested from 0F to 125F and following 7-day activated stand and severe physical environments with all tests equaling or exceeding discharge requirements. The batteries delivered up to 14 Ahrs on an 18:2 receive-transmit duty cycle, with the energy density ranging from 64 watt hrs/lb. at 0F to as high as 118 watt hrs/lb at 75F. The report discusses the development of the design, the construction technique, and the testing results and conclusions. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N71-30447# Grenoble Univ. (France). Faculte des Sciences.
USE OF THE GRENOBLE HIGH FLUX REACTOR IN BIOLOGY [UTILISATION DU REACTEUR A HAUT FLUX DE GRENOBLE EN BIOLOGIE]
Emile D. Duee (Ph.D. Thesis) 1970 24 p refs In FRENCH
(NP-18462) Avail: AEC Depository Libraries

After some remarks on the subject of neutron diffraction, with special reference to biological uses, the possibilities of applying this method to the determination of protein structure are examined on the basis of already published experimental results. Because of the nondestructive nature of neutrons for proteins, neutron diffraction is an ideal method for the study of proteins of high molecular weight which are difficult to crystallize and very sensitive to X rays. The advantages of the equipment foreseen for the Grenoble high flux reactor are discussed. Author (NSA)

N71-30662*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Dept.
PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, Period Ending 30 Jun. 1971
30 Jun. 1971 80 p Sponsored in part by AEC
(NASA Order W-12853)
(NASA-CR-119314; QPR-21) Avail: NTIS CSCL 06M

Activities in the Planetary Quarantine Program are reported. During this period, emphasis was placed on evaluating the problem of the recently discovered hardy soil spores in spacecraft sterilization. As a result, it was recommended that sterilization cycles be based on the estimated actual distribution of resistance among organisms. Other activities reported include: thermoradiation experiments and modeling, the effects of relative humidity on particle adhesion to surfaces, removal of organisms from dust particles, and bacterial spore inactivation. F.O.S.

N71-30663*# Public Health Service, Phoenix, Ariz. Applied Microbiology and Planetary Quarantine Section.
SERVICES PROVIDED IN SUPPORT OF THE PLANETARY QUARANTINE REQUIREMENTS OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, APRIL – JUNE 1971
Martin S. Favero Jun. 1971 25 p
(NASA Order W-13062)
(NASA-CR-119313; Rept-34) Avail: NTIS CSCL 06M

The research in microbiology for planetary quarantine is reported. As a result of tests conducted with inexperienced individuals using the swab-rinse technique, it was concluded that the experience and training of the individual collecting the sample is not a significant variable in the recovery of microorganisms. Experiments were conducted which show that the fraction of Bacillus subtilis spores in methyl methacrylate that survive grinding in the biodetection grinder is very small. Other activities reported include the identification of 1123 microorganisms isolated from the Apollo 14 spacecraft, and the evaluation of a terminal sterilization process for unmanned lander spacecraft. F.O.S.

N71-30670*# Stanford Research Inst., Menlo Park, Calif.
DISTURBANCE OF HUMAN SLEEP BY SUBSONIC JET AIRCRAFT NOISE AND SIMULATED SONIC BOOMS
Jerome S. Lukas, Mary E. Dobbs, and Karl D. Kryter Washington NASA Jul. 1971 68 p refs
(Contract NAS1-9286)
(NASA-CR-1780) Avail: NTIS

Four subjects in each of three age groups (young - about 7 years of age, middle age - about 51 years, and old - about 71 years of age) were exposed for 20 nights to simulated sonic booms and subsonic jet flyover noises. Four intensities of each stimulus were usually presented twice each night. The results show that the children were relatively unresponsive to the booms or the flyover noise regardless of intensity. The middle-aged men were behaviorally awakened by about 18 percent of the booms and by about 18 percent of the flyover noises. The older men, in contrast, were awakened by about 32 percent of the booms and to about the same

extent by flyover noises. Two subgroups of relatively low and high sensitivity to noise during sleep were found in both the middle-aged and old groups. Author

N71-30671*# Scripta Technica, Inc., Washington, D.C.
THERMOPHILIC BACTERIA [STUDIEN UEBER THERMOPHILE BACTERIEN]
V. Oprescu NASA Jun. 1971 20 p refs Transl. into ENGLISH from Arch. Hyg. Bakteriol. (Munich), v. 33, 1898 p 164–186
(Contract NASw-2036)
(NASA-TT-F-13795) Avail: NTIS CSCL 06M

An attempt is made, for identification purposes, to determine the properties of thermophilic bacteria. Particular attention is given to zymogensis and enzymosis. Results are given in tabular form. E.H.W.

N71-30795*# General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
METHODS OF RESEARCH ON INFECTIOUS DISEASE IN SPACEFLIGHT. A PRELIMINARY STUDY OF APPLICATION OF BIOSATELLITE TECHNIQUES TO STUDIES OF INFECTIOUS DISEASE PROCESSES
James J. Shull 17 Feb. 1971 20 p refs
(Contract NASw-2073)
(NASA-CR-119243) Avail: NTIS CSCL 06E

The means selected to implement research on infectious disease in manned space flight are summarized. Recommendations for research are discussed including the physical behavior of infectious aerosols; microbial aerosol viability, longevity, and virulence; epidemiological studies; response to vaccines; long term space flight effects on local host defenses and specific immune mechanisms; repopulation of gastrointestinal flora; latent and slow virus infection in space flight; host factors affecting latent infection; changes in microbial flora; and isolation effects on susceptibility to infection. J.M.

N71-30803*# Translation Consultants, Ltd., Arlington, Va.
THE ARTICULATORY FREQUENCY SPECTRUM AS AN INDICATOR OF THE DEGREE AND NATURE OF EMOTIONAL STRESS IN MAN [CHASTOTNYY SPEKTR RICHI KAK POKAZATEL STEPENI I KHARAKTERA EMOTSIONALNOGO NAPRYAZHENIYA U CHELOVEKA]
V. A. Popov et al Washington NASA Jul. 1971 10 p refs Transl. into ENGLISH from Zh. Vysshei Nervoi Deytelnosti (Moscow), v. 21, no. 1, 1971 p 104–109
(Contract NASw-2038)
(NASA-TT-F-13772) Avail: NTIS CSCL 05E

The results obtained using improved methods of estimating human emotional states by the changes in the frequency characteristics of his speech are outlined. The mean weighted frequency (centroid) of the spectrum was determined in model experiments on actors, as well as on cosmonauts during their flight in the Voskhod-2 spacecraft. The changes in the articulatory spectrum were compared with the heart rate. A study of the envelopes at the output of the five-channel octave frequency analyzer, in addition to estimating the degree of emotional stress, has made it possible to differentiate the positive (delight, joy) and negative (alarm, fear) emotional character of speech. The accuracy of determination is increased at high degrees of emotional stress. Author

N71-30810# Human Resources Research Organization, Alexandria, Va.
SHAPE PERCEPTION JUDGMENTS AS A FUNCTION OF STIMULUS ORIENTATION, STIMULUS BACKGROUND, AND PERCEPTUAL STYLE
Edward W. Frederickson Dec. 1970 62 p refs
(Contract DAHC19-70-C-0012)
(AD-722479; HumRRO-TR-70-24) Avail: NTIS CSCL 5/10

Two experiments tested the validity of the shape-slant invariance hypothesis. The first tests used two-dimensional rectangular stimuli to obtain shape judgment responses from 20 subjects. Individual differences between subjects were found to significantly influence shape judgement, but stimulus shape did not. In the second experiment, 68 subjects judged the shape and rotational orientation of three-dimensional rectangular solids. A statistical procedure was used to control this source of variance. Shape and rotation of the stimulus objects were found to influence judgments of shape and rotational orientation. Errors of judging stimulus shape and rotation were significantly correlated, as were the objective and projective stimulus shapes. These later results were interpreted as providing support for the shape-slant invariance hypothesis. Author (GRA)

N71-30811# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PATTERN RECOGNITION MODEL BASED ON CORTICAL ANATOMY
Willis O. Mahaffay (M.S. Thesis) Mar. 1971 122 p refs
(AD-722651; GE/EE/71-18) Avail: NTIS CSCL 6/4

The report presents material supporting a model for pattern recognition that closely approximates the connectivity evident in the neurons of the cerebral cortex. A computer simulation of the model was tested on three sets of patterns (letters and geometric figures) and the results show that pattern separation is generally the same as for a human. Author (GRA)

N71-30826*# National Aeronautics and Space Administration, Washington, D.C.
PLANETARY QUARANTINE ANALYSIS FOR AN UNMANNED MARS ORBITER
A. R. Hoffman (JPL), R. J. Reichert (JPL), N. R. Haynes (JPL), and L. B. Hall Jul. 1971 19 p refs Presented at the 14th Planetary Meeting of COSPAR, Seattle, Jun. 17–Jul. 2 1971
(NASA-TM-X-67238) Avail: NTIS CSCL 06M

The analysis approach and the planetary quarantine model being applied to the program for allocating and estimating the probability of contamination associated with potential biological contamination sources are described. It is shown that three sources, accidential impact of the spacecraft, loose particles, and gases used for attitude control and pressurization form the major hazards. The results of the analysis indicate that with the planned mission strategy, including aiming point and delivery biases, and the imposition of facility and procedural control during the systems test operations to minimize particulate and microbial contamination of the spacecraft, the planetary quarantine constraints for the Mariner Mars 1971 mission are being satisfied. Author

N71-30840# Royal Swedish Academy of Engineering Sciences, Stockholm.
BIOCHEMISTRY AND BIOTECHNOLOGY, AN OUTLOOK TOWARDS THE YEAR 2000 [BIOKEMI OCH BIOTEKNOLOGI, EN UTBLICK MOT AER 2000]
Goesta Ehrensvaerd *In its* Articles and Speeches at the Anniv. of IVA, 1919–1969 1969 p 62–81 In Swedish (See N71-30839 18-34)
Avail: NTIS; Esselte AB, Stockholm: 18 SKR

The many heart transplantations during recent years have made immunochemistry into a permanent research field. The question is raised whether biochemistry can help to reject antigens and antibodies, whether enzymes can solve pollution problems, and whether a human being can be connected to a computer. ESRO

N71-30847*# Ocean Systems, Inc., Tarrytown, N.Y. Research and Development Lab.
RELATIVE DECOMPRESSION RISKS OF SPACECRAFT CABIN ATMOSPHERES: COMPARISON OF GASES USING MINIATURE PIGS Final Report

R. W. Hamilton, Jr., B. P. Uberto, and G. F. Doebbler (Contract NAS2-5481)
(NASA-CR-114355) Avail: NTIS CSCL 06K

The miniature pig was used as the animal model for the analysis of altitude decompression sickness and for determining the relative decompression hazards of various potential space-cabin atmospheres. By replicate decompressions of individual pigs after saturation exposure in the same and in different inert gas environments a relative ranking of five inert gas mixtures in terms of increasing severity of decompression hazard was made. The order of increasing risk for the gases studied was: neon<crude neon<helium<nitrogen<argon. In these experiments miniature pigs were saturated for 22 hours in a controlled environmental chamber at a pressure slightly greater than atmospheric (900 mm Hg). Individual pigs were decompressed in an oxygen environment to 105 mm Hg (46,000 feet altitude equivalent). Gases used were nitrogen, helium, neon, argon, and crude neon (a mixture of 75% neon and 25% helium obtained from air separation plants). Signs of decompression sickness were analyzed in terms of severity, time of occurrence, individual animal response, and reproducibility of response. Results were analyzed in terms of both a supersaturation limiting concept of decompression risk and the correlation of observed decompression risk for each gas with parameters of bubble growth characteristic of the gases. Reasonably good correlation between some bubble growth parameters and decompression sickness scores for the gases was found. Author

N71-30856*+ Informatics Tisco, Inc., College Park, Md.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 88)
Washington NASA Apr. 1971 103 p refs Sponsored by NASA
(NASA-SP-7011(88)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N71-31040# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
INTERNAL REPRESENTATION BY COMPLEX DYNAMIC PROCESSES [INTERNE REPRESENTATIES BIJ COMPLEXE DYAMISCHE PROCESSEN]
W. H. Janssen [1970] 54 p refs In DUTCH
(IZF-1970-21; TDCK-56713) Avail: NTIS

A survey of psychological and ergonomic investigation in the field of the so-called internal representations is given. The concept of internal representation, which is borrowed from the computer sciences, encloses amongst other things the field of metal imagery. The literature of various fields where IR seems to be important is examined for relevance to the theoretical and empirical development of the concept, notably for the as yet little studied situations in which an IR is based on external dynamical processes. It appears that relevant data from investigations on mental and eidetic imagery, amodal perception, perception of movement, associative memory structures and coding, paired-associate learning, anticipation and tracking, and cognitive schemes, are scarce. Author

N71-31053# National Inst. of Radiological Sciences, Chiba (Japan).
[RADIOLOGICAL SCIENCES RESEARCH] Annual Report, 1969-1970
Oct. 1970 87 p refs
(NIRS-9) Avail: AEC Depository Libraries

The National Institute of Radiological Sciences has several responsibilities in developing its research program: one of them is to advance the understanding of the effects of ionizing radiation on the human body, and another to develop beneficial applications of these radiations. To carry out the research works, the Institute has 11 departments grouped into the categories of physics and chemistry, biology and genetics, environmental study, and medicine. Programs for the peaceful use of atomic energy currently in progress include studies on internal exposure plutonium and studies on fundamental and clinical aspects of bone marrow transplantation. Author

N71-31077*+ Informatics Tisco, Inc., College Park, Md.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO A CONTINUING BIBLIOGRAPHY
Washington NASA Jan. 1971 835 p refs Sponsored by NASA
(NASA-SP-7011(85)) Avail: NTIS HC $9.00 CSCL 06C

A cumulative index is presented of the abstracts contained in NASA SP-7011 (73) through NASA SP-7011 (84) of Aerospace Medicine and Biology: A Continuing Bibliography. It serves as a current abstracting and announcement journal for references on bioscience and biotechnology. Entries prepared by the two contributing organizations are identified as NASA entries by their STAR accession numbers (N70-10000 series); and AIAA entries by their IAA accession numbers (A70-10000 series). This cumulative index includes a subject index, a personal author index and a corporate source index. Author

N71-31178*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
GERMINATION AND GROWTH OF SELECTED HIGHER PLANTS IN A SIMULATED SPACE CABIN ENVIRONMENT Final Report, 9 Apr. - 30 Aug. 1970
Christopher T. Lind Mar. 1971 22 p refs Sponsored in part by NASA
(NASA-CR-119379; AMRL-TR-70-121) Avail: NTIS CSCL 06C

Four species of higher plants including Raphanus sativus, Lactuca sativa, Brassica oleracea, and Capsicum frutescens were exposed to an environment simulating the conditions within the NASA Skylab. Seventy-two hundred seeds and four hundred eighty mature seedlings were placed in altitude chambers for a ten-day period. One chamber was held at 260 mm Hg total pressure (27,000 ft) and a duplicate chamber was held at 725 mm Hg total pressure and served as a control. Both chambers had equal partial pressures of oxygen and carbon dioxide. No significant differences in seed germination or seedling development were apparent between the control and reduced pressure treatments. All species obtained a high germination percentage during the ten-day exposure to the simulated space cabin environment. Author

N71-31201*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 89, APRIL 1971
May 1971 134 p refs
(NASA-SP-7011(89)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exiobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citationaccompanied by its abstract. Author

N71-31230*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES. SUPPLEMENT 90, MAY 1971
Jun. 1971 142 p refs
(NASA-SP-7011(90)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exiobiology, and personnel factors recieve appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N71-31231*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 91, JUNE 1971
Jul. 1971 99 p refs
(NASA-SP-7011(91)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and psychological, and environmental effects to which man is subjected during and following simulated flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exiobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N71-31236# Louisville Univ., Ky. Performance Research Lab.
EFFECTS OF 48 HOURS OF CONTINUOUS WORK AND SLEEP LOSS ON SUSTAINED PERFORMANCE Interim Report
Ben B. Morgan, Jr., Bill R. Brown, and Earl A. Alluisi 30 Sep. 1970 110 p refs
(Contract DAHC 19-69-C-0009)
(AD-722816; ITR-70-16) Avail: NTIS CSCL 5/10

The synthetic-work approach was employed in an investigation of the decrements in performance produced by a 48-hour period of continuous work and sleep loss, and the recovery of performance from these decrements as a result of 24 hours of rest and recovery. Ten Navy and Air Force ROTC cadets worked the tasks of a multiple-task performance (MTP) battery 12 hours a week (in three, 4-hour sessions) during a 4-week training period. Subsequently, they were required to work 2 days according to a 4-4-4-12 schedule, work 48 hours continuously, observe 24 hours of rest and recovery, and finally, work 2 additional days on a 4-4-4-12 schedule. Performance during the 48 hours of continuous work was greatly influenced by the circadian rhythm. The first performance decrements occurred after approximately 18 hours of work; during the early morning hours of the first night, average performance decreased to approximately 82% of baseline performance. During the first half of the second day of work, performance improved to about 90% of baseline, but decreased again during the night to approximately 67% of baseline. All measures of performance indicated that the recovery of performance was complete (to baseline levels) following the 24-hour period of rest and recovery. Author (GRA)

N71-31237# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
AN INVESTIGATION OF THE EFFECTS OF A HELIUM-OXYGEN BREATHING MIXTURE ON HEARING IN NAVAL PERSONNEL
Day Waterman and Paul F. Smith 18 Sep. 1970 10 p refs
(AD-722658; SMRL-MR-70-7; NAVMED-MF12.524.004-9012D) Avail: NTIS CSCL 6/19

Hearing levels of three subjects were measured at 125, 1000 and 8000 Hertz while the subjects were breathing air and while breathing an 80%/20% mixture of helium and oxygen. No significant change in hearing levels which could be attributed to the effects of the gas breathed were detected during or following a thirty-minute period on helium-oxygen. Author (GRA)

N71-31238# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
THE EFFECT OF INTERMITTENT EXPOSURE TO 3 PERCENT CO2 ON ACID-BASE BALANCE AND ELECTROLYTE EXCRETION Interim Report
Karl E. Schaefer, C. C. Morgan, Arthur A. Messler, and Michael J. Jacey 16 Jul. 1970 15 p refs
(AD-722662; SMRL-635; NAVMED-M4306.02-7050B-02) Avail: NTIS CSCL 6/19

The effects of intermittent exposure to CO2 on acid-base balance was investigated. One subject was exposed for six days to increasing CO2 rising at a constant rate from 0.03 to 3.0% CO2 within a period of 15 hours followed by a nine hour period of air breathing. To assess the acid-base parameters arterialized capillary blood was taken from the finger twice daily at 8 AM and 11 PM corresponding with the beginning and end of the intermittent exposure to CO2. Urine specimens were collected at the same times daily while venous blood samples were obtained on alternate days. Hydrogen ion concentrations and PCO2 in the arterialized capillary blood were found increased during the air breathing periods of the fourth and fifth day but returned to normal during the sixth day. The elimination of this CO2 accumulation in the blood was accomplished through renal mechanism showing a marked increase in urine volume, organic acids, titratable acidity, ammonia and hydrogen ion excretion during the fourth and fifth day. The stress effect produced by intermittent exposure to CO2 in this subject must have been minimal since the 17-hydroxysteroid excretion did not change. Author (GRA)

N71-31271# Joint Publications Research Service, Washington, D.C.
PROBLEM OF DYNAMIC MODELING OF MICROBIOLOGICAL PRODUCTION PROCESSES
Ya. Kozhesnik 20 Jul. 1971 22 p refs Transl. into ENGLISH from Biofizika (Moscow), v. 16, no. 2, 1971 p 270-284
(JPRS-53634) Avail: NTIS

The mathematical principles of modeling microbiological processes in the biomass, substrate, and inhibitor systems are described. Examples are given of the analysis of models with analog computers. Author

N71-31334# Joint Publications Research Service, Washington, D.C.
ROLE OF BIOGENIC AMINES (SEROTONIN) IN ONSET OF VESTIBULAR DISTURBANCES DURING FLIGHT
E. V. Lapayev et al 26 Jul. 1971 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 3, 1971 p 370-374
(JPRS-53678) Avail: NTIS

A study was made of changes in function of the vestibular analyzer and of metabolic changes during flight with artificially created turbulence, or under the effect of rocking on stands. In flight, there was a decrease in vestibular resistance and changes were observed in metabolism of pyridoxine and serotonin. The involvement of changes in metabolism of pyridoxine and serotonin as a cause of changes in function of the vestibular system was confirmed in studies on stands with simulation of metabolic changes. Author

N71-31335# Bunker-Ramo Corp., Thousand Oaks, Calif. Electronic Systems Div.
THE CNOCOM/MIS PILOT SYSTEM STUDY Final Report.

1 May 1970 – 30 Apr. 1971
William D. Wilkinson, Dionisio E. Costales, Dennis J. Sullivan, and Frank E. Hughes Apr. 1971 96 p refs
(Contract N00014-70-C-0293)
(AD-722803; D58-1U3) Avail: NTIS CSCL 5/10

Final report describes the results of a study to investigate methods of implementing a pilot or interim man/machine subsystem for the CNO Command/Management Information System and to develop a plan for utilization of that subsystem. Three alternate configurations were examined: a display capability integrated into an existing large scale computer (1108), a display subsystem developed for an existing computer (1410, 7090, or 9300), and a display subsystem developed for a new stand alone processor. A trade-off analysis was performed to evaluate the three alternatives based on seven application specific criteria and the third alternative was recommended. Software modules for the subsystem were specified to include information handling, computational, and graphic display modules. Experimental procedures involving briefings, training, test runs, measurements, and questionnaires were designed in order to evaluate system performance, derive future man/machine configuration requirements and demonstrate system capability to interface with the data base. Author (GRA)

N71-31336# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.
PARAMETERS OF HUMAN PATTERN PERCEPTION Semiannual Progress Report, 18 Sep. 1970 – 18 Mar. 1971
Selby H. Evans 18 Apr. 1971 39 p refs
(Contract DAAD05-68-C-0176; Proj. Themis)
(AD-722794; SAPR-7) Avail: NTIS CSCL 5/10

Methodological accomplishments included: The development of a computer program capable of generating comparable Markov and position dependent stimuli from the same prototypes; and the development of a hierarchical computer system which produces insect-like configurations from familiar components for research on storage-aided pattern recognition. Multivariate and traditional experimental approaches were used to explore the effect of statistical properties of pattern components on feature selection. Additional empirical advancements were made in further specifying the effect of knowledge of results on schematic concept formation and in testing a methodology for assessing encoding and storage characteristics of nameable, spatial pattern components. Methodological and empirical results were further extended to the area of individual differences. A multivariate model of feature utilization was specified in greater 9detail. This class of models was also further extended to a proposed role in the development of an efficient man-machine system for real-world pattern identification. In addition a model for storage-aided pattern acquisitions is being constructed. Author (GRA)

N71-31481# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A COLLATION OF ANTHROPOMETRY. VOLUME 1: A-H
John W. Garrett and Kenneth W. Kennedy Mar. 1971 1108 p refs
(AD-723629; AMRL-TR-68-1-Vol-1) Avail: NTIS HC (Individually priced)/MF $0.95 CSCL 6/16

The collation is a volume 1 of a 2-volume critical comparison of measuring techniques and anthropometric data from 48 American and foreign sources. Approximately 2000 dimensions cover the anthropometry from 16 countries. All titles and descriptions of dimensions from foreign references are presented in the original language as well as in English; in many instances the collation presents translations into English for the first time of classic anthropometric techniques that serve as the basis of the art. The presentation is such that each entry is complete in itself. All equivalent and nonequivalent dimensions of the same or similar title (or description) are cited and explicit differences, if any, are quoted. References to other anthropometric dimensions and data permit easy and quick comparisons, selection of appropriate dimensions, as well as precise understanding of measuring techniques. The data and techniques described are of direct use in the design of all types of equipment requiring the human operator; in the design and sizing of clothing; and will have academic, medical, and other biological applications. GRA

N71-31499# California Univ., Livermore. Lawrence Radiation Lab.
PREDICTION OF THE DOSAGE TO MAN FROM THE FALLOUT OF NUCLEAR DEVICES. 7: ESTIMATION OF THE MAXIMUM DOSE RATE FROM THE CONTINUOUS RELEASE OF RADIONUCLIDES TO THE BIOSPHERE
Michael W. Pratt 2 Nov. 1970 77 p refs Sponsored by AEC
(UCRL-50163-Pt-7) Avail: NTIS

A method is described for estimating the maximum internal dose rate to man that could result from the continuous release, at a constant rate, of any given radionuclide to the biosphere. Calculations pertaining to the equilibrium dose rate to bone and whole body are presented to illustrate the method. The results of the analysis are shown to provide a new departure for the establishment of maximum permissible concentration (MPC) values in air and water that take into account the concentration factor associated with the entry of a radionuclide into food chains. They are also shown to be useful as a guide in establishing the maximum rate of radionuclides to the environment that could occur without exceeding allowable dosage limits. Author (NSA)

N71-31500# Oak Ridge National Lab., Tenn.
RADIATION DOSES AT THE ALTITUDE OF SUPERSONIC TRANSPORT FLIGHTS
O. C. Allkofer and M. Simon Apr. 1971 16 p refs Transl. into ENGLISH from Atompraxis (Karlsruhe, West Ger.), v. 16, 1970 p 186 – 195 Sponsored by AEC
(ORNL-tr-2455) Avail: NTIS

Supersonic transport flights (SST) will take place at an altitude of 19 to 25 km, which may result in exposure of the personnel to radiation doses in excess of the permissible dose of 5 rem/yr. Estimates were made of the radiation dose rates due to cosmic radiation, heavy primary particles, and solar radiation at this altitude. The special problem of very strong solar flares that occur only rarely is discussed. It was concluded that the yearly flight time for the crew of a supersonic aircraft might possibly be limited by the radiation dose and dose rate encountered during some flights. NSA

N71-31526# Aviation Medical Research Unit.
DRB AVIATION MEDICAL RESEARCH UNIT REPORTS, VOLUME 1, 1964 – 1968
Geoffrey Melvill Jones, comp. May 1971 204 p refs Reprinted
(DR-208-VOL-1) Avail: NTIS

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12. PREDOMINANT DIRECTION OF GAZE DURING SLOW HEAD ROTATION S. Mishkin and G. M. Jones p 118–125 refs (See N71-31538 18-04)

13. DEPENDENCE OF VISUAL TRACKING CAPABILITY UPON STIMULUS PREDICTABILITY J. A. Michael and G. M. Jones p 126–137 refs (See N71-31539 18-04)

14. NEURAL REFLECTION OF VESTIBULAR MECHANICS G. M. Jones p 138–151 refs (See N71-31540 18-04)

15. THE PHYSIOLOGICAL ADAPTATION TO UNILATERAL SEMICIRCULAR CANAL INACTIVATION H. Zuckerman p 152–157 refs (See N71-31541 18-04)

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17. A DYNAMIC MODEL OF THE SEMICIRCULAR CANAL R. F. Stevenson p 171–174 refs (See N71-31543 18-04)

18. FROM LAND TO SPACE IN A GENERATION: AN EVOLUTIONARY CHALLENGE G. M. Jones p 175–198 refs (See N71-31544 18-04)

N71-31527# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

DYNAMICS OF THE SEMICIRCULAR CANALS COMPARED IN YAW, PITCH AND ROLL

Geoffrey Melvill Jones, W. Barry, and N. Kowalsky *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 1–11 refs Repr. from Aerospace Med., no. 35, 1964 p 984–989; see A64-27607 (See N71-31526 18-04)

(AMRU-R-64-1; A64-27607) Avail: NTIS

Treating the semicircular canal system as a 3-D sensing device experiments were performed to compare the patterns of response to rotational stimuli in the yaw, pitch, and roll planes of the head. The method of post-rotational stimulation on an electronically controlled turntable was used, both subjective cupulometry (S) and objective measurement of slow phase eye angular velocity (O) being employed to measure the time course of response decay. The mean time constants obtained from (S) in yaw, pitch and roll were 10.2 (+ or − 1.8), 5.3 (+ or − 0.7), and 6.1 (+ or − 1.2) respectively, the corresponding values from (O) being 15.6 (+ or − 1.2), 6.6 (+ or − 0.7), and 4.0 (+ or − 0.4). It is concluded that the effective time constants of post-rotational decay in the planes of pitch and roll are considerably shorter than in yaw. Numerical examples are given of the penalty to be expected from these data. Author

N71-31528# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

PREDOMINANCE OF ANTICOMPENSATORY OCULOMOTOR RESPONSE DURING RAPID HEAD ROTATION

G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 12–19 refs Repr. from Aerospace Med., no. 35, 1964 p 985–988; see A64-27603 (See N71-31526 18-04)

(AMRU-R-64-2; A64-27603) Avail: NTIS

Experiments with human subjects are described which show that when the head is jerked with high angular velocity, say to the right, large anticompensatory flicks drive the eyes well over in the leading direction, in this case to the right, where they remain until the head slows down. Then the expected compensatory response to the left begins to appear. If the high head angular velocity is artificially maintained, as on a turntable, the expected compensatory response may be virtually eliminated for several seconds, presumably owing to prolonged action of a strongly maintained anticompensatory response. It is suggested that vestibular signals can exercise a substantial measure of control over the quick, anticompensatory, phase of nystagmus. Author

N71-31529# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

THE CRITICAL DEPENDENCE OF SEMICIRCULAR CANAL FUNCTION UPON ITS PHYSICAL DIMENSIONS

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 20–25 refs Repr. from Proc. Intern. Symp. on Vestibular and Oculomotor Probl. (Tokyo), 1965 p 57–61 (See N71-31526 18-04)

(AMRU-R-65-1) Avail: NTIS

It was found that as the size of a tube carrying fluid flow decreases, the ratio of viscous forces to those due to inertia rapidly increases. Angular velocity transduction was observed as the main functional role of canals critically dependent on dimensions. It is shown that the canal is always matched to the frequency range to which the head will be exposed in natural life. J.A.M.

N71-31530# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

DISTURBANCE OF OCULOMOTOR CONTROL IN FLIGHT

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 26–34 refs Repr. from Aerospace Med., no. 36, 1965 p 461–465; see A65-24082 (See N71-31526 18-04)

(AMRU-R-65-2; A65-24082) Avail: NTIS

An over-all analysis of the physiological processes contributing to stabilization of the retinal image reveals four sensory and three motor information channels. Visual tracking and vestibulo-ocular mechanisms disclosing a number of limitations imposed on the over-all system by the flight environment are considered. Frequency response of visual tracking, virtual absence of visual tracking in the roll plane, and the vestibular errors is introduced by prolonged turning and the predominance of an anticompensatory vestibulo-ocular response during rapid head rotation. Author

N71-31531# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

SPATIAL AND DYNAMIC ASPECTS OF VISUAL FIXATION

Geoffrey Melvill Jones and J. H. Milsum *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 35–51 refs Repr. from IEEE Trans. Bio-Med. Eng., no. 12, 1965 p 54–62; see A65-26978 (See N71-31526 18-04)

(AMRU-R-65-3; A65-26978) Avail: NTIS

The physiological processes concerned with the difficult dynamic task of fixating the retinal image during normal body and head movement are examined with a control engineering perspective. Spatial relationships between the two system inputs (visual and vestibular) and three outputs (operating on the eye-in-skull, skull-on-body, and body-in-space platforms) are examined in the context of the geometry of the environment with the aid of an information flow diagram. With head free, the added perturbations of natural movement exceed tracking capabilities. Over

the frequency range 0.1-5.0 c/s the semicircular canal subsystem then provides angular velocity information for powerful complementary servostabilization. Author

N71-31532# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

THEORETICAL MAN-MACHINE INTERACTION WHICH MIGHT LEAD TO LOSS OF AIRCRAFT CONTROL

J. F. Martin and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 52-59 refs Repr. from Aerospace Med. no. 36, 1965 p 713-717; see A65-32628 (See N71-31526 18-04)

(AMRU-R-65-4; A65-32628) Avail: NTIS

A theoretical model is developed for a pilot-aircraft interaction wherein the pilot relies entirely upon his sense of the relative gravity vector for orientation information. It is shown that the illusory effects arising from motions could cause him to operate the aircraft controls in a diametrically opposite manner to what would be appropriate. This model may serve as a basis to account for otherwise unexplained losses of control in jet transport aircraft. Author

N71-31533# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

INFLUENCE OF EYE LID MOVEMENT UPON ELECTRO-OCULOGRAPHIC RECORDING OF VERTICAL EYE MOVEMENTS

W. Barry and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 60-66 refs Repr. from Aerospace Med., No. 36, 1965 p 855-898; see A66-17662 (See N71-31526 18-04)

(AMRU-R-65-5; A66-17662) Avail: NTIS

The cause of an EOG artifact noted during vertical saccadic eye movements was investigated. Records of eye movements were simultaneously obtained from dc electro-oculography and a movie photographic method in response to intermittent vertical saccadic changes in visual fixation. The artifact was found to run the same time course as the upper eye lid movement and is probably directly attributable to this. An argument is advanced suggesting that changes in the relative position of the eyelid and eyeball are responsible for the artifact, and a simplified model of the electrical setup by which the eyeball, lids and electrodes might function is presented. Author

N71-31534# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

THE VESTIBULAR CONTRIBUTION TO STABILIZATION OF THE RETINAL IMAGE

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 67-78 refs Repr. from Proc. of NASA Symp. on the Role of the Vestibular Organs in the Exploration of Space, 1965 p 163-172; see N66-16106 (See N71-31526 18-04)

(AMRU-R-65-6; N66-16106) Avail: NTIS

The vestibulo-ocular reflex system is examined as an essential backup to the visual fixation reflex. The vestibular stimulus is seen as the output from an angular velocity transducing hydrodynamic system, feeding the central nervous system with angular velocity modulated information, provided the mechanical stimulus is confined within a specified frequency range. The central nervous angular velocity signal is envisaged as driving an angular velocity control system through the physiology of the oculomotor system. It appears that the dynamic response of the vestibulo-ocular system improves as that of the visual tracking systems fails, to the extent that the former operates with a gain of 1 at frequencies associated with failure of the latter. Author

N71-31535# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

THE INTERDEPENDENCE OF CLINICAL NEUROLOGY AND NEUROPHYSIOLOGY: AN HISTORICAL REVIEW OF THE VESTIBULO-OCULAR REFLEX

Seymour Mishkin *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 79-91 refs Repr. from McGill Med. J. (Montreal), 1966 p 80-97 (See N71-31526 18-04)

(AMRU-R-66-1) Avail: NTIS

Early theories of nurophysiology based on empirical data are reviewed. With the discovery of basic neurological mechanisms, specific experimental designs were applied in vestibulo-ocular reflex research. J.A.M.

N71-31536# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

VESTIBULAR INAPTITUDE IN THE ENVIRONMENTS OF FLIGHT AND SPACE

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 92-105 refs Repr. from J. Laryngol. Otol. (London), no. 53, 1966 p 207-221; see A67-35884 (See N71-31526 18-04)

(AMRU-R-66-2) Avail: NTIS

The vestibular system associated with body movement, particularly the head, is examined in an aerospace environment. The exaggerated effects of angular and linear acceleration on the body are discussed, along with the physiological effects on the otolith organs, semicurcular canals associated with the central nervous system, and the vestibulo-ocular reflex. J.A.M.

N71-31537# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

INTERACTIONS BETWEEN OPTOKINETIC AND VESTIBULO-OSCULAR RESPONSES DURING HEAD ROTATION IN VARIOUS PLANES

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 106-117 refs Repr. from Aerospace Med., no. 37, 1966 p 172-177; see A-22583 (See N71-31526 18-04)

(AMRU-R-66-3; A-22583) Avail: NTIS

Subjects were accelerated on an electronically controlled turntable to a chosen angular velocity which was then maintained constant for 3 minutes and finally decelerated to a standstill. They either had their heads tilted backwards, or sideways, at 45 deg to the vertical axis of the turntable. Thus they were simultaneously exposed to equal angular velocity stimuli in the skull planes either of yaw and roll, or of yaw and pitch. The eyes were open and looking at an appropriate stationary optokinetic stimulator. Measurement of compensatory eye angular velocities in the relevant planes with a movie-photographic technique revealed very poor optokinetic following in the roll plane and hence wide dissociation of oculomotor responses in yaw and roll. In yaw and pitch the components of eye angular velocity were always equal to one another, despite failure to reach the numerical value required for visual fixation. Author

N71-31538# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

PREDOMINANT DIRECTION OF GAZE DURING SLOW HEAD ROTATION

Seymour Mishkin and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964-1968 May 1971 p 118-125 refs Repr. from Aerospace Med., no. 37, 1966 p 897-901; see A66-32179, also A66-42449

(AMRU-R.66-4; A66-32179; A66-42449) Avail: NTIS

Experiments with human subjects oscillated sinusoidally about a vertical axis have shown that on superimposed nystagmoid pattern of response, there tends to be a slow waveform change in the average eye position relative to the skull. In these experiments, this waveform had the same frequency as the oscillatory motion of the head but was approximately 90 deg phase advanced. This implies that during the sinusoidal head motion the

waveform defining averaged eye position relative to the skull was approximately in phase with head angular velocity. Author

N71-31539# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

DEPENDENCE OF VISUAL TRACKING CAPABILITY UPON STIMULUS PREDICTABILITY

Joel A. Michael and Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 126–137 refs Repr. from Vision Res. (London), no. 6, 1966 p 707–716 (See N71-31526 15-04)

(AMRU-R-66-5) Avail: NTIS

Variable, narrow bandwidths of random noise were used to determine the ability of the human visual tracking system to maintain fixation on moving stimuli of various degrees of predictability. The results indicate that there is a continuous relationship between stimulus predictability and tracking capability; the less predictable the stimulus motion, the greater the phase shift between stimulus and response at a given frequency. Thus, a predictive component in the system operating in the unpredictive mode and permits pattern following of head and target movements. Author

N71-31540# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

NEURAL REFLECTION OF VESTIBULAR MECHANICS

G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 138–151 refs Repr. from Proc. of 3d NASA Symp. on the Role of Vestibular Organs in the Exploration of Space, 1967 p 169–182; see N68-29139, also N68-29128 (See N71-31526 18-04)

(AMRU-R-67-1; N68-29139) Avail: NTIS

The semicircular canal function during natural angular head movements is investigated, including hydrodynamic components of the canal performing under angular acceleration. Studies were performed using singular and combined vestibular stimuli which resulted in uncertainty in the physiological responses. The effects of linear acceleration and a directional change of the linear acceleration vector are also examined. J.A.M.

N71-31541# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

THE PHYSIOLOGICAL ADAPTATION TO UNILATERAL SEMICIRCULAR CANAL INACTIVATION

Hyman Zuckerman *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 152–157 refs Repr. from McGill Med. J. (Montreal), v. 36, no. 1, Feb. 1967 p 8–13; see A67-81039 (See N71-31526 18-04)

(AMRU-R-67-2; A67-81039) Avail: NTIS

Normal unanaesthetized cats were subjected to a range of oscillatory rotational stimuli, their heads fixed to the rotating platform, with the horizontal canals in the plane of rotation. The same cats were then subjected to similar stimuli at intervals after unilateral obstruction of the canal. As opposed to unilateral labyrinthectomy, this procedure does not interfere with ampullary afferent innervation leaving the steady state condition unimpared. Results are presented showing a consistent fall in gain of the overall vestibulo-ocular response by a factor of 2 in post operative animals. All stimuli were conducted in absolute darkness. Author

N71-31542# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

SOME AVIATION MEDICAL ASPECTS OF FLIGHTCREW FATIGUE

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 158–170 refs Repr. from the publ. 'A Study of the Legal Aspects of Flight Crew Fatigue' by Vivian C. Slight Montreal, McGill Univ., Inst. of Air and Space Law, 1967 (See N71-31526 18-04)

(AMRU-R-67-3) Avail: NTIS

The stressing aerospace environments are reviewed causing fatigue in flight crews. The short time or transient effects associated with continued exercise of a skilled task, the long term effects which accummulate during extended periods of over work, and the unpleasantness of going without sleep are considered. The legal control in matters affecting flight crew fatigue is also discussed, including aircraft service ability, inspection schedules, design criteria, and navigational constraint. J.A.M.

N71-31543# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

A DYNAMIC MODEL OF THE SEMICIRCULAR CANAL

Robert F. Stevenson *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 171–174 refs Repr. from McGill Med. J. (Montreal), 1968 p 54–58 (See N71-31526 18-04)

(AMRU-R-68-1) Avail: NTIS

Particle movements are recorded in response to changes in angular velocity. The canal velocity was plotted, and a comparison was made with the flow patterns using a frame-by-frame analysis. Vestibular nerves correlated with the fluid flow within the semicircular canals are studied as a function of fluid viscosity, fluid inertia, and the restoration force exerted on the fluid displacement by the cupula. J.A.M.

N71-31544# McGill Univ., Montreal (Quebec). Aviation Medical Research Unit.

FROM LAND TO SPACE IN A GENERATION: AN EVOLUTIONARY CHALLENGE

Geoffrey Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 1, 1964–1968 May 1971 p 175–198 refs Repr. from Aerospace Med., no. 39, 1968 p 1271–1283; see A69-14067 (See N71-31526 18-04)

(AMRU-R-68-2; A-69-14067) Avail: NTIS

A state of the art review is presented on the effects of angular velocity and linear acceleration of visual perception. The neurophysiological aspects of semicircular canal velocity affecting eye and head movements of personnel in aerospace environments are given. Simultaneous records of yaw, roll, and pitch eye movements relative to the skull obtained during recovery from an eight turn spin in a jet trainer aircraft are also included, as well as a movie camera design for 3-D recording of eye movements in flight. J.A.M.

N71-31587# Arizona State Univ., Tempe.

EFFECTS OF HYPERBARIC ENVIRONMENTS ON NEUROMUSCULAR CONTROL IN PRIMATES

Dwight Sutton, Eugene M. Taylor, and Jerry D. Burns 1 Apr. 1971 41 p refs

(Contract N00014-68-A-0150; Grant RR-00168)

(AD-723829; TR-71-01) Avail: NTIS CSCL 6/19

Four monkeys were individually exposed to hyperbaric environments consisting of air, nitrogen-oxygen (pO2 = 200 mm Hg), and argon-oxygen (pO2 = 200/1000 mm Hg). Neuromuscular control was assessed via a force discrimination task during the course of simulated dives lasting 7-16 hrs. Performance decrements were related to depth and to gas mixtures. Task failure occurred at 400-500 FSW with argon-oxygen. Air was tolerated at pressures equivalent to 500-700 FSW. Nitrogen-oxygen produced total failures in force discrimination at 600-800 FSW. During compression, performance efficiency was often sustained, although other measures indicated neuromuscular control problems at relatively low pressures. Adaptation to intermediate pressures was exhibited by recovery of effectiveness in performing the force discrimination task. Related measures of cardiac function in waking monkeys revealed stability over all the pressures and gas mixes utilized in the study. The study indicates that the expression of inert gas narcosis relates to pO2 of the breathing gas and that the condition is not clearly related to unusual cardiovascular adjustments. Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N71-30401*# Martin Co., Baltimore, Md. Space Systems Div.
PILOT COMPARTMENT AIRBAG RESTRAINT PROGRAM Final Report
Carl C. Clark, Carl Blechschmidt, and Fay Gordon Jul. 1964 85 p refs
(Contract NASw-877)
(NASA-CR-60169; ER-13551) Avail: NTIS CSCL 06K

Manned impact tests of airbag restraint systems in a preliminary experimentation box, a spacecraft simulator, and a passenger airplane simulator were carried out to show the feasibility of such active elastic restraint systems, in which restoring forces can be varied by varying bag pressures to ensure the prevention of bottoming. Analog simulation of the airbag restraint system duplicated the experimental vertical drops and allowed predictions beyond the experimental effort. The system has a resonant frequency of 2.05 cps with a transmissibility of 4.8 at resonance. The analog model permitted solution of typical launch and reentry as well as impact loads. Indications form both the experimental program and the analog program are that the airbag-type restraint system would provide excellent isolation from spacecraft landing impacts and launch and reentry vibrations with the astronaut in any attitude. The study also led to the development of an active elastic airbag restraint system for aircraft passenger protection. Author

N71-30448# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
STUDY OF CLOTHES PROVIDING EFFECTIVE TRITIUM PROTECTION [ETUDE D'UN SCAPHANDRE EFFICACE VIS-A-VIS DU TRITIUM]
Pierre Marteau Feb. 1971 52 p refs In FRENCH
(CEA-N-1413) Avail: AEC Depository Libraries

The manufacture of individual clothes providing maximum protection against tritium and tritiated water vapor was studied. A review of the properties of tritium, its biological effects and the hazards it presents, was made. A thorough investigation of the various polymerized and rubberized materials suitable for making such clothes was carried out. A protective suit of original design, made of the material found to be the most effective in view of the mechanical resistance criteria imposed, was manufactured and tested. Since tritium and tritiated water diffuse very easily through all materials, the use of such clothes may be extended to almost all substances which present chemical or radioactive hazards. NSA

N71-30588# Royal Swedish Academy of Engineering Sciences, Stockholm.
BORON FROM AN ENVIRONMENTAL POINT OF VIEW [BOR FRAEN MILJOESYNPUNKT]
1970 25 p refs In SWEDISH
(IVA-33) Avail: NTIS

By comparison of previous measurements of boron content in river-, lake-, or sea water with today's knowledge of the same, it has been possible to identify the effect of the increase of boron in effluents, on green plants, and human beings. It appears that from the data so far available on the boron content in nature, boron and its pollution does not constitute an acute problem for the environment. However, a number of actions are recommended such as the investigation of the minimum toxic dose for green plants and for human beings, the average increase of boron in effluents, etc. ESRO

N71-30599# Royal Swedish Academy of Engineering Sciences, Stockholm.
PLASTICS SEEN FROM AN ENVIRONMENTAL POINT OF VIEW [PLASTER FRAEN MILJOESYNPUNKT]
1969 15 p In SWEDISH
(IVA-Medd-160) Avail: NTIS

Combustion of waste products causes, due to their atmospheric corrosion, a great problem for their disposal. It is discussed under what conditions it is best to dispose of plastic waste material. ESRO

N71-30751*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM (EC/LSS) FOR THE MODULAR SPACE STATION (OPTION 4)
Hubert B. Wells and Andrew G. Kromis 15 Feb. 1971 52 p
(NASA-TM-X-64603) Avail: NTIS CSCL 06K

The major parameters selected for comparison were logistics, assembly weights, power, and cost. The EC/LSS used for comparison is capable of supporting a six man crew continuously over an extended period of time with regular resupply. Nominal crew rotation and resupply were considered to be on a 90-day cycle. The EC/LSS must maintain a system life requirement of 10 years through maintenance, spares, and redundancy. The pre-phase A type investigation included open loop, partially closed loops, and full closure of both the oxygen and water cycles. The selected EC/LSS approach is a partially closed water loop and an open oxygen loop. Author

N71-30867# Joint Publications Research Service, Washington, D.C.
BIOELECTRICAL CONTROL: MAN AND AUTOMATIC SYSTEMS
21 Jun. 1971 69 p refs Transl. into ENGLISH from the book 'Bioelektrischeskoye Upravleniye, Chelovek i Avtomaticheskiye Sistemy' Moscow, Nauka, 1970 p 501-546 and 557-573
(JPRS-53414) Avail: NTIS

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4. HEURISTIC ASPECTS OF THE PROBLEM 'MAN AND LARGE SCALE SYSTEMS' V. N. Pushkin p 43-55 refs (See N71-30871 18-05)

5. HEURISTIC DECISION-MAKING PROGRAMS A. V. Napalkov p 56-70 refs (See N71-30872 18-05)

N71-30868# Joint Publications Research Service, Washington, D.C.
DEVELOPING METHODS OF DESIGNING AND EVALUATING INFORMATION DISPLAY SYSTEMS
D. I. Ageykin et al *In its* Bioelec. Control: Man and Autom. Systems 21 Jun. 1971 p 1-17 refs (See N71-30867 18-05)
Avail: NTIS

New methods of designing and evaluating information display systems for industrial application are reviewed, and stages in developing the operator's work station in control systems are suggested. The following sequence of events is recommended for designing such stations: (1) determining preliminary distribution of control functions between the human operator and automatic

devices; (2) compiling control algorithm tables; (3) compiling a tabular graph of events; (4) establishing a breakdown of events by categories of significance; (5) analyzing monitored parameters and choice of possible methods for determining their values; (6) analyzing control actions and their breakdown by type; (7) selecting information display methods; and (8) constructing and analyzing the first variant of the display system. In addition, the interaction between operator and machine in complex automatic control systems is briefly discussed, along with existing technical devices which facilitate operator functioning in various production situations.
A.C.R.

N71-30869# Joint Publications Research Service, Washington, D.C.
PRINCIPLES OF CONSTRUCTING COMPLEXES FOR CONTINUOUS MONITORING OF THE HUMAN ORGANISM AND AUTOMATIC NORMALIZATION OF ITS STATE
V. M. Akhutin *In its* Bioelec. Control: Man and Autom. Systems 21 Jun. 1971 p 18–32 refs (See N71-30867 18-05)
Avail: NTIS

Principles and methods of automatic, continuous monitoring of the psychophysiological condition of operators acting as a control link in a closed man machine system are discussed, with emphasis on biomedical situations. Techniques and problems of normalizing the operator's condition where necessary are also treated. Monitoring systems of the human operator's state have three inputs: data on slowly varying physiological parameters; data on rapidly changing biomedical situations supplied by a number of electronic recording devices; and information from psychological monitors for ongoing evaluation of the operator's state. Normalization methods include machine control of the operator's state, nonmachine control using contact devises, and nonmachine control in which contact juxtaposition with the operator is not required.
A.C.R.

N71-30870# Joint Publications Research Service, Washington, D.C.
ENGINEERING-PSYCHOLOGICAL PROBLEMS IN CONSTRUCTING LARGE SCALE SYSTEMS
I. V. Yeremenko et al *In its* Bioelec. Control: Man and Autom. Systems 21 Jun. 1971 p 33–42 refs (See N71-30867 18-05)
Avail: NTIS

The construction of large-scale automated control systems requiring contributions from a number of different fields is discussed, emphasizing that each task in the development stage involves solution of specific engineering-psychological problems. Specific attention is given to theoretical considerations in designing operator activity in such systems. The process must include the following tasks: (1) determining place and role of the operator in different links and levels of control; (2) defining the functional duties of operators with different specialities; (3) psychologically analyzing operator activity; (4) identifying physiological and psychological requirements for operator input/output characteristics; and (5) constructing a psychological model of operator behavior. Solving these problems requires joint effort by systems analysts, engineering psychologists, mathematicians, and specialists in physical and biological cybernetics.
A.C.R.

N71-30871# Joint Publications Research Service, Washington, D.C.
HEURISTIC ASPECTS OF THE PROBLEM 'MAN AND LARGE SCALE SYSTEMS'
V. N. Pushkin *In its* Bioelec. Control: Man and Autom. Systems 21 Jun. 1971 p 43–55 refs (See N71-30867 18-05)
Avail: NTIS

Heuristic aspects of the design and operation of large-scale man machine systems are discussed, emphasizing that heuristic activity forms the basis for solving problems and for formulating control strategies. Concepts and processes related to automatic control in such situations are treated, and the failure to fully appreciate the importance of creative thought and human interrelationships in operating controlled systems is criticized. Experimental psychological studies in formulating problem solving strategies are described, emphasizing that the construction of a dynamic information model is underlying requirement for analyzing human heuristic processes. Finally, the two components of thought in problem solving and the problem of distributing functions between man and machine during the design of large-scale systems are analyzed.
A.C.R.

N71-30872# Joint Publications Research Service, Washington, D.C.
HEURISTIC DECISION-MAKING PROGRAMS
A. V. Napalkov *In its* Bioelec. Control: Man and Autom. Systems 21 Jun. 1971 p 56–70 refs (See N71-30867 18-05)
Avail: NTIS

Human capacity for decision making over a broad class of situations was investigated for the case when specific details in the approach to each information problem are given. The objective was to derive a complex set of programs representing different levels of heuristic activity. Integrated methods of investigation were used, and experimental study of brain functioning was combined with formulation of heuristic computer programs and development of theoretical models. Detailed descriptions are given of the methodology used in developing the programs, and analysis of the resulting models indicated that after instruction in solving problems of one or several classes, such computer programs are capable of solving other situations in the same class or finding solutions to unforeseen situations.
A.C.R.

N71-30873# National Defense Research Organization TNO, The Hague (Netherlands).
THE REAL EAR ATTENUATION OF COM-FIT EARPLUGS [DE GELUIDVERZWAKKING VAN COM-FIT OORDOPJES, FABRIKAAT SIGMA ENG. CO.]
A. M. Mimpen and R. Plomp 1971 8 p In DUTCH; ENGLISH summary
(IZF-1971-4; TDCK-57366) Avail: NTIS

With five subjects the real-ear attenuation was determined for Com-Fit earplugs. These earplugs showed a good sound attenuation particularly at frequencies important for hearing damages, although the standard deviations are considerable.
Author

N71-30937# National Defense Research Organization TNO, The Hague (Netherlands). Inst. for Perception.
DISORIENTATION IN AEROSPACE FLIGHT: A REVIEW OF EXPERIMENTAL STUDIES RELATING TO THE OCULOGRAVIC ILLUSION AND THE CORIOLIS EFFECT
F. Phillip van Eyl 1970 13 p refs
(IZF-1970-25; TDCK-56756) Avail: NTIS

Literature on the oculogravic illusion and the Coriolis effect is reviewed. Conclusions indicate that there is a strong possibility that several physiological systems play a role, and that, particularly where Coriolis effect is concerned, experience leads to suppression of reactions to certain vestibular stimulation.
Author

N71-31113*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
PREDICTION OF LIPID UPTAKE BY PROSTHETIC HEART VALVE POPPETS FROM SOLUBILITY PARAMETERS
J. Moscanin, D. D. Lawson, H. P. Chin (Univ. of Southern Calif.), E. C. Harrison (Univ. of Southern Calif.), and D. H. Blankenhorn (Univ. of Southern Calif.) *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 54–60 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 06B

Solubility of lipids in silicone rubber and other commonly used poppet materials is assessed. Solubility parameter theory is based on principles derived from thermodynamic considerations.

The results of this analysis predict that highly polar compounds, such as phospholipids or proteins, should not be present in silicone rubber poppets, which is in agreement with observations. Author

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N71-30452# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

PHYSICAL CHEMISTRY SERVICE Semiannual Progress Report, Jan.–Jun. 1970 [SERVICE DE CHIMIE PHYSIQUE: RAPPORT SEMESTRIEL JANVIER–JUIN 1970]

Jan. 1971 57 p refs In FRENCH
(CEA-N-1409) Avail: AEC Depository Libraries

Topics covered are: the afterglow of He* produced by excitation with intense pulses of electrons and the effects of additional elements on this afterglow; the stimulated emission produced as a result of the pulsed radiolysis of N2; the pulsed radiolysis of NH3; the radiolysis of aqueous solutions; a chemical dosimetric method of measuring the electron incident energy in pulsed radiolysis; the pulsed radiolysis and the flash photolysis of KIO3 aqueous solutions; NMR study of the polymerization of solid acrylamide and acrylic acid; X ray diffraction studies of hydrated divalent fluorides and U complex fluorides; and Raman studies on UF6NO, UF6Cs, UF6NH4, UF6, XeF6UF5, and XeF5AsF6. NSA

N71-30509*# Scientific Translation Service, Santa Barbara, Calif.

POLYMERIZATION REACTIONS OF ALPHA-AMINOPROPIONITRILE AND THE CHARACTERISTICS OF THEIR PRODUCTS [ALPHA-AMINOPUROPIONITORIRY NOJUGO HANNO OYOBI SEISEIBUTSU NO TOKUSHITSY]

Eiji Seijo (M.S. Thesis) Washington NASA Jul. 1971 50 p refs Transl. into ENGLISH from Japanese report
(Contract NASw-2035)
(NASA-TT-F-13712) Avail: NTIS CSCL 07C

In the equilibrium reaction of alpha aminopropionitrile, alpha-alpha' iminodipropionitrile, and ammonia which produces alanyl peptide and other products, the products were examined for polymers which effect the reaction. Secondary long period transitional metallic sulfates and their aminoacetronitrile chains were added, and sealed-tube thermal polymerization was performed at 80 C and 100 C. The extinction rates of alpha-aminopropionitrile and alpha-alpha' iminodipropionitrile were measured. To obtain information on the undetermined molecular distribution in the products, gel filtration tests were made for various groups of catalysts and various degrees of reactivity for raw materials. Author

N71-30510*# Scientific Translation Service, Santa Barbara, Calif.

POLYMERIZATION OF AMINOACETONITRILE [AMINOASETONITORIRU NOJUGO-HANNO NI TSUITE]

Eppei Yano (M.S. Thesis) Washington NASA Jul. 1971 41 p refs Transl. into ENGLISH from Japanese report
(Contract NASw-2035)
(NASA-TT-F-13713) Avail: NTIS CSCL 07C

A method of synthesizing primitive proteins by the polymerization of aminoacetonitrile is described. Using iminodiacetonitriles and ammonia as polymer raw materials, various catalysts were added in an autoclave, the effects of the amount of ammonia on the polymer reaction and the catalytic effects after thermal polymerization at 80 C were studied. The separation and quantitative analysis of the raw materials, using an automatic amino acid analyzer with a pH 3.25 or pH 5.28 citric acid soda buffer solution as the developing agent are outlined. Ammonia effects and catalytic effects of additives on the polymerization reaction and the separation and infrared absorption spectra of polymer products are summarized. Solution polymerization reactions in N,N dimethyl formamide solvent are also included. J.M.

N71-30581# Bendix Corp., Kansas City, Mo.

STUDY OF THE DIMENSIONAL STABILITY OF MOLDED MOLECULAR SIEVE SUPPORT DESICCANT

J. E. Hess Mar. 1971 41 p refs Sponsored in part by AEC
(BDX-613-380) Avail: NTIS

Test results are presented on the effects of curing temperature and relative humidity on the dimensional stability of molded molecular sieve desiccant. Of particular interest were the dimensional changes recorded when the molded parts were measured while adsorbing or losing moisture. Author

N71-30601# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Heisse Chemie.

ABSORPTION SPECTRA OF Pu(III), Pu(IV), Pu(VI), U(IV), AND U(VI) IN NITRIC ACID AND TRI-n-BUTYL PHOSPHATE n-ALKANE SOLUTIONS AND THEIR USE IN AUTOMATIC PROCESS CONTROL [DIE ABSORPTIONSSPEKTREN VON PU(III), PU(IV), PU(VI), U(IV) UND U(VI) IN SALPETERSAEURE UND TRI-N-BUTYLPHOSPHAT-N-ALKAN LOESUNGEN UND IHRE ANWENDUNG IN DER AUTOMATISCHEN PROZESSKONTROLLE]

H. Schmieder, E. Kuhn, and W. Ochsenfield Nov. 1970 84 p refs In GERMAN; ENGLISH summary
(KFK-1306) Avail: AEC Depository Libraries

The absorption spectra of Pu(III), (IV), (VI), U(IV), and U(VI) in the nitric acid range of about 0.3 to 8 M were measured. Characteristic peaks for the different oxidation states were selected and, using an IBM 360/65 computer, empirical functions for the relation molar extinction coefficients-nitric acid concentration were evaluated. For Pu(IV) and U(VI) the spectra in 20 vol% TBP-n-alkane at different nitric acid concentrations were also taken. For all oxidation states the validity of Beer's-law was shown. For Pu(IV) and U(VI) solutions the electric conductivities were measured. In connection with the spectra it was also possible to determine the nitric acid concentration by approximative calculation. Use of the spectrophotometry for in-line analysis in Purex process and the principles of construction for a spectrophotometric in-line instrument are discussed. Author (NSA)

N71-30719# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Physics.

CONSECUTIVE ION-MOLECULE REACTIONS IN ACETYLENE INVESTIGATED BY CHARGE EXCHANGE MASS SPECTROMETRY

I. Szabo and P. J. Derrick 30 Nov. 1970 30 p refs
(Contract F61052-68-C-0067)
(AD-722470; SR-3; AFCRL-71-0134) Avail: NTIS CSCL 7/4

The consecutive ion-molecule reactions in acetylene within the pressure limits of 0.00001 and 0.01 torr have been investigated as a function of the energy transferred to the acetylene molecule during the initial ionization by charge exchange with incident positive ions of low kinetic energy. The reactions of the molecular ion in the ground electronic state pi(u)(-1) are distinguished from those of the molecular ion in an excited electronic state sigma(g)(-1). The various chain sequences of reaction, including those involving ions with uneven numbers of carbon atoms, are elucidated, and numerous reactions proposed by earlier workers are shown to be unimportant in the pressure range investigated. Rate constants are calculated for the various ion-molecule reactions. Author (GRA)

N71-30725# Signals Research and Development Establishment, Christchurch (England).

A COMPARISON OF THE PHOTOLUMINESCENT AND

ELECTROLUMINESCENT SPECTRA OF Er(3+) IN ZnSe
M. R. Brown, A. F. J. Cox, W. A. Shand, and J. M. Williams Nov. 1970 21 p refs
(AD-722429; SRDE-70059) Avail: NTIS CSCL 7/4

The report presents a comparison of the photoluminescent and electroluminescent spectra of Er(3+) doped ZnSe and establishes that the emission sites in each case are different in origin. Two types of rare earth sites have been observed in electroluminescence and six sites in photoluminescence. The defect structure of each site is discussed. Author (GRA)

N71-30762# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.
FYZIKO-CHEMICAL MEASUREMENTS ON HYDROLYTIC URANIUM PRECIPITATES UNDER AN INERT ATMOSPHERE Progress Report, 1969 [KOMPLEX FYZIKALNE CHEMICKYCH MERENI V INERTNI ATMOSFERE Vyzkums Zpravy Za Rok 1969]
V. Beran 1970 25 p refs In Czechoslovakian
(UJV-2617-Ch) Avail: AEC Depository Libraries

A brief description is given of an apparatus for research in a high-purity inert atmosphere. Magnetic susceptibility and proton magnetic resonance measurements, x-ray structural analysis, and thermal analysis of hydrolytic precipitates with various contents of U(IV) and U(VI) were carried out on this apparatus. The valency state of uranium was studied polarographically. The following preliminary conclusions can be drawn from the measurements: (1) An interaction between U(4+) and UO2(2+) takes place in the precipitate, and the resulting valency state lies between U(IV) and U(VI). (2) The hydrolytic precipitate of U(IV) is a hydroxide with a structure near to that of UO2. (3) The UO2OH : 3H2O complex is another chemical substance that probably exists in a dimeric form. (4) A new phase, UO3 : 3H2O, was found; it was prepared by oxidation of U(OH)4. NSA

N71-30812# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
NUCLEAR MAGNETIC RESONANCE SPECTRAL CHROMATOGRAPHY: NEW SUPERIOR PARAMAGNETIC SHIFT REAGENTS FOR SPECTRAL CLARIFICATION Final Report, Nov. 1960 – Nov. 1970
Robert E. Sievers and Roger E. Rondeau Dec. 1970 39 p refs
(AD-722440; ARL-70-0285) Avail: NTIS CSCL 7/3

Nuclear magnetic resonance spectral chromatography is defined as the separation and clarification of NMR spectral bands of a single compound or a mixture by specific interaction of one or more moieties with a soluble coordinatively unsaturated paramagnetic species acting as a Lewis acid. Addition of certain lanthanide complexes of 2,2,6,6-tetramethyl-3,5-heptane-dione(thd) or 1,1,1,2,2,3,3-heptafluoro-7,7-dimethyl-4,6-octanedione (fod) results in greatly shifted and simplified NMR spectra of various organic compounds. Complexes of fod with europium (III) and praseodymium (III) are far superior to those of thd because they are much more soluble in organic solvents and are better Lewis acids owing to the electron withdrawing effect of the fluorines. Eu(fod)3 forms complexes even with such poor Lewis bases as di-n-butylether. Consequently, the fod chelates are effective for spectral clarification for much broader classes of compounds and concentration ranges than the thd chelates. Author (GRA)

N71-30966# Physical Studies, Inc., Morgantown, W.Va.
POLYATOMIC VIBRATIONAL INTENSITY CALCULATIONS Final Report, 1 May 1970 – 1 Mar. 1971
Robert G. Breene, Jr. 1 Mar. 1971 56 p refs
(Contract F19628-70-C-0267)
(AD-722468; AFCRL-71-0139) Avail: NTIS CSCL 7/4

Methods of intensity estimation are developed whereby most of the polyatomic molecules of interest to certain aspects of atmospheric research may be treated. The ozone molecule is treated in extenso, a method for the computation of matrix element ratios between the first overtone and the fundamental and between the second overtone and the fundamental being developed for nondegenerate vibrations in the course thereof. The nitrous oxide molecule is also treated in extenso, a method for analogous matrix element ratios for twofold degenerate vibrations being developed in the course of this treatment. Nitric acid and methane intensities are also considered, the matrix element ratios being developed for the three fold degenerate case in connection with the latter. Author (GRA)

N71-30912# Technische Univ., Berlin (West Germany). Fakultaet fuer Bergbau und Huettenwesen.
ELECTROCHEMICAL BEHAVIOR OF METAL SULFIDE ANODES [ELEKTROCHEMISCHES VERHALTEN VON METALLSULFIDANODEN]
Helmut Laig-Hoerstebrock (Ph.D. Thesis) 1969 75 p refs In GERMAN
Avail: NTIS

The anodic behavior of Ni3S2, Cu2S, Co4S3, and FeS is studied with emphasis on the Ni3S2 compound. Sulfide dissociation in Ni3S2, Cu2S, and Co4S3 below a characteristic potential proceeds only up to the higher sulfides whereas below the potential sulfur is formed. A potentiostatic current-time dissociation model is formulated that develops the current limitations affected through metal ion diffusion into the porous electrode layers formed by the higher sulfides or sulfur. A high potential current output for a Ni3S2 electrode is limited to 60%: addition of chlorine or bromine ions increases Ni3S2 current density. Transl. by G.G.

N71-31034# Council for Scientific and Industrial Research, Pretoria (South Africa).
EFFECT OF THE DIFFUSION OF FERRIC IONS ON THE RATE OF OXIDATION OF URANIUM DIOXIDE (UO2) AND THE OXIDE (U3O8) IN A SULPHURIC ACID MEDIUM [INFLUENCE DE LA DIFFUSION DES IONS FERRIQUES SUR LA CINETIQUE D'OXYDATION DU DIOXYDE D'URANIUM (UO2) ET DE L'OXYDE (U3O8) EN MILIEU SULFURIQUE]
B. Tinturier et al 1969 7 p refs Transl. into ENGLISH Proc. French Acad. Sci. (France), v. 265, 9 Oct. 1967 p 769–772
Avail: NTIS

The rate of a slow solid-liquid diffusion reaction may be predicted by allowing for the chemical conditions prevailing at the reaction interface as a result of the diffusion. The oxidation of uranium dioxide and the oxide by ferric ions in a sulphuric acid medium is discussed, and the resulting equations are checked. The effect of the diffusion is confirmed on the basis of the low activation energy values obtained. Author

N71-31035 Illinois Univ., Urbana.
THE EFFECT OF HIGH PRESSURE ON THE QUADRUPOLE INTERACTION IN IRON FLUORINE COMPOUNDS
Charles William Christoe (Ph.D. Thesis) 1969 114 p
Avail: Univ. Microfilms Order No. 70-13280

Using the interatomic distance as a parameter, Mossbauer spectra have been observed for the three isomorphic ferric compounds K3FeF6, Na3FeF6, and (NH4)3FeF6. In addition, the compressibility and the pressure dependence of c/a were determined by X-ray diffraction for the ferrous compound FeF2. In all of these compounds, the local environment of the iron ion is a slightly distorted octahedron of fluoride ions. A detailed analysis was made of the quadrupole splitting of the Mossbauer spectra for both the ferrous and the ferric salts. The analysis proceeded along two lines: the usual point-charge approximation and a covalent approximation based upon configuration interaction. Although the quadrupole splitting increased with pressure in the ferric case and decreased in the ferrous case, the local crystalline discussions were shown to decrease in both cases when the pressure exceeded about fifty kilobars. Dissert. Abstr.

N71-31038# Council for Scientific and Industrial Research, Pretoria (South Africa).
DIFFUSION IN BINARY LIQUID SYSTEMS [DIFFUZIIA V BINARNYKH ZHIDKIKH SISTEMAKH]
R. M. Vasenin 1969 12 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (USSR), v. 43, no. 4, 1969 p 1201–1206
Avail: NTIS

On the basis of the Flory–Huggins theory of solutions which form without a change in volume, equations have been deduced for the relationship between the coefficient of interdiffusion of a binary liquid system, its composition, the self diffusion coefficients of its components, and the geometric and energetic parameters of the system. The relations described accurately diffusion in systems which are nearly ideal, and satisfactorily in those with small deviations from the ideal. In the case of systems with a strongly associated component, the geometric and energetic parameters are not constant, but decrease with increasing concentration of the associated component. The interdiffusion coefficients vary with compositon along a convex curve in the case of systems with a negative energy parameter, and along a concave curve in the case of those with a positive energy parameter. Author

N71-31056# Physics Lab. RVO-TNO, The Hague (Netherlands).
DIGITAL SPECTRUM ANALYSIS
C. van Schooneveld Jul. 1970 56 p refs
(PHL-1970-17; TDCK-56902) Avail: NTIS

The modern digital approach to short time spectrum analysis was investigated. Relevant parts of the available literature were cast in a unified framework to serve as a mathematical reference for the preparation of spectrum analysis programs for general or special purpose digital computers. Also, an effort was made to relate the specific theory for digital discrete time operations to the more familiar results of continuous time spectrum analysis. Among the various general methods of spectrum analysis, only one method is discussed namely the one in which the desired (short time) spectrum is obtained as a weighted Fourier transform of the observed signal on a limited time interval, or observation window. Conceptually, this method is equivalent to a bank of analog filters, tuned at frequencies space by (1/T)Hz, where T is the length of the observation window. Author

N71-31080 Wisconsin Univ., Madison.
REACTION OF ATOMIC HYDROGEN ON POLYCRYSTALLINE GRAPHITE SURFACES
Robert Kinkade Gould (Ph.D. Thesis) 1969 179 p
Avail: Univ. Microfilms Order No. 70-3544

A series of experiments are described in which polycrystalline graphite is exposed to atomic hydrogen and the rate of formation of methane is measured. The dependence of the reaction on temperature and on the rate of arrival of incident atomic hydrogen is examined. The production of atomic hydrogen was accomplished by the thermal dissociation of H2 on hot tungsten. A series of measurements of the production rate of atomic hydrogen are described and compared with the results of earlier workers. The effect of contaminants on the tungsten surface is examined. Measurements of the sticking probability of atomic hydrogen on graphite are described. Dissert. Abstr.

N71-31159# Council for Scientific and Industrial Research, Pretoria (South Africa).
POLAROGRAPHIC DETERMINATION OF OXYGEN [POLAROGRAFICZNE OZNACZANIE TLENU]
K. Linhart et al 1970 6 p refs Transl. into ENGLISH from Chem. Anal. (Warsaw), v. 2, 1957 p 183 Presented at 1st Nationwide Polarographic Conf., Warsaw, 1–5 Feb. 1956
Avail: NTIS

A new analytical method has been developed suitable for the determination of oxygen in acid gases. This is based on the reaction in acid solution between Cr2(+) ions and oxygen, occurring in terms of the following equation: 4 Cr2(+) + O2 + 4H(+) yields 4 Cr 3(+) + 2 H2O and the polarographic determination of the decrease in Cr2(+) ions equivalent to the amount of the reacting oxygen. Author

N71-31165 Kansas State Univ., Manhattan.
LOW ENERGY ELECTRON RADIOLYSIS OF GASEOUS METHANE, ETHANE AND ETHYLENE
Clifton Donald Finney (Ph.D. Thesis) 1970 98 p
Avail: Univ. Microfilms Order No. 70-16628

Two, high flux, low cathode area photoelectron sources were developed. Product yields and ion currents were measured as a function of electron energy under single impact combinations for methane, ethane, and ethylene reactants. Results were obtained in the form of product yields, total ionization cross sections, and reaction thresholds. For each reactant gas products were observed above and below the ionization potential. Lowest product thresholds were 6.7, 6.4, and 3.3 eV for CH4, C2H6 and C2H4 reactants, respectively. Acetylene was the product analyzed with ethylene reactant, and its very low appearance threshold of 3.3 eV suggests a primary triplet transition. A discussion is given comparing the results with those of a study on the low energy solid phase radiolysis of ethylene previously performed. Dissert. Abstr.

N71-31166 California Inst. of Tech., Pasadena.
A MOLECULAR DYNAMICS STUDY OF THE MICROSCOPIC PROPERTIES OF SIMPLE DENSE FLUIDS
Paul Lee Fehder (Ph.D. Thesis) 1970 297 p
Avail: Univ. Microfilms Order No. 70-14837

The microscopic properties of a two-dimensional model dense fluid of Lennard-Jones disks were studied using the so-called molecular dynamics method. Analyses of the computer-generated simulation data in terms of conventional thermodynamic and distribution functions verify the physical validity of the model and the simulation technique. The radial distribution functions g(r) computed from the simulation data exhibit several subsidiary features rather similar to those appearing in some of the g(r) functions obtained by X-ray and thermal neutron diffraction measurements on real simple liquids. In the case of the model fluid, these anomalous features are thought to reflect the existence of two or more alternative configurations for local ordering. A quantitative analysis of diffusion in the model fluid shows that the cooperative mechanism is not inconsistent with the statistical predictions of existing theories of singlet, or self-diffusion in liquids. Dissert. Abstr.

N71-31181*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
MALFUNCTION INVESTIGATION AND CHEMICAL ANALYSIS CAPABILITY MANUAL
1 Aug. 1970 42 p Revised
(NASA-TM-X-67242; GP-225-Rev-1) Avail: NTIS CSCL 07D

The capabilities of the Malfunction Analysis Branch (MAB) and the equipment available are described, and the methods by which requesters can best employ the MAB services are outlined. Author

N71-31232 Michigan State Univ., East Lansing.
ANALYSIS AND APPLICATION OF CURRENT PULSE TECHNIQUES IN ELECTROCHEMICAL KINETICS
Peter H. Daum (Ph.D. Thesis) 1969 153 p
Avail: Univ. Microfilms Order No. 70-15015

The determinate errors involved in the various methods of analyzing the data of the current impulse and coulostatic techniques when the relaxations are neither charge transfer nor diffusion controlled are discussed as a function of the ratio of the charge and diffusional time constants tau sub c/tau sub d. The validity of the application of the simple charge transfer assumption

is found to be dependent on an accurate knowledge of the capacitance and on accurate measurements of the potential at short times in the decay. The accuracies of nomographic and a curve fitting technique of correcting the data for the influences of diffusion are discussed. The accuracy of the first is found to be dependent on an accurate knowledge of the capacitance and short time measurements while that of the second is found to be relatively independent of tau sub c/tau sub d and the time at which the measurements are made. The current impulse technique is used to study the electrochemical kinetics of the hexacyanoferrate(III)/(II) couple on platinum. Dissert. Abstr.

N71-31233 Akron Univ., Ohio.
A STUDY OF THE FACTORS AFFECTING THE REINFORCEMENT OF AMORPHOUS ELASTOMERS BY POLYMERIC FILLERS
Ronald Lyle Denecour (Ph.D. Thesis) 1969 356 p
Avail: Univ. Microfilms Order No. 70-12660

A study was conducted to ascertain the general influence of several factors on the reinforcement of elastomers by polymeric fillers. The filler and rubber lattices were blended, coagulated, vulcanized, and tested at temperatures below the glass transition temperature of the fillers. A more quantitative estimate of the filler retained and the relative influence of network density and filler molecular weight was obtained by transmission infrared spectroscopy. The effect of filler rubber bonding was deduced from uniaxial tensile strength measurements of well bonded and nonbonded fillers (Teflon). Physical forces appear to be sufficient to insure good adhesion. Reinforcement is nil in the nonbonded case, the filled vulcanizate having the same tensile strength as the unfilled vulcanizate. Both transmission electron microscopic and density measurements were made on stretched filled vulcanizates to ascertain the dependency of void formation associated with particles, with particle size for well bonded particles. Dissert. Abstr.

N71-31293# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
SPIN FREE QUANTUM CHEMISTRY. 11: PERTURBATION THEORY FOR INTERACTION ENERGIES
F. A. Matsen and B. R. Junker 4 Sep. 1970 30 p refs Prepared in cooperation with Texas Univ.
(Grant NSF GP-17593)
(AD-197477; WIS-TCI-372) Avail: NTIS CSCL 07D

Perturbation theory provides a method for a calculation of interaction energies between aggregates (atoms and/or molecules) which, in principle, does not require taking small differences between large quantitites. In such theory consideration must be given to the permutational symmetry. The spinfree formulation of the polyelectronic problem employs directly the permutational symmetry of the problem and is therefore well-suited for the treatment of interaction energies. Special restrictions on the perturbation function that lead to the Hirschfelder-Van der Avoird, Hirschfelder-Silbey, Murrell-Shaw, and Amos-Musher formalisms are discussed. The perburbation energies in these formalisms are a function of those restrictions and only in infinite order is the dependency removed. Author (GRA)

N71-31312*# Scientific Translation Service, Santa Barbara, Calif.
MODEL STUDIES ON THE FORMATION OF ORGANIC COMPOUNDS IN SIMPLE ATMOSPHERIC GASES BY ELECTRIC DISCHARGES [MODELLUNTERSUCHUNGEN ZUR BILDUNG ORGANISCHER VERBINDUNGEN IN ATMOSPHAEREN EINFACHER GASE DURCH ELEKTRISCH ENTLADUNGEN]
Kurt Heyns et al Washington NASA Jul. 1971 16 p refs Transl. into ENGLISH from Naturwissenschaften (Berlin), v. 44, no. 14, 1957 p 385-389
(Contract NASw-2035)
(NASA-TT-F-13757) Avail: NTIS CSCL 07D

Reference is made to the formation of amino acids from simple gas mixtures under the influence of electrical discharges as a model reaction for questions on the composition of the atmosphere in early stages of the Earth's history, in connection with the original synthesis of basic biochemical components. In an atmosphere containing hydrogen sulfide, ammonium thiocyanate forms, along with two still unidentified sulfur-containing compounds. Amino acid synthesis is not markedly affected by the presence of hydrogen sulfide. Under certain conditions, at higher reaction temperatures, compounds with guanido groups form, such as glycocyamine. The volatile reaction products resulting from the thermal decomposition of amino acids serve for resynthesis of the simplest representatives of the amino acids if oxygen is excluded, and with appropriate addition of energy. Author

N71-31355# Grumman Aerospace Corp., Bethpage, N.Y.
RESEARCH INTO THE FORMATION KINETICS OF POLYPYROMELLITIMIDE BY IR ABSORPTION SPECTROSCOPY
L. A. Laius et al Jul. 1971 19 p refs Transl. into ENGLISH from High-Mol. Compds. (USSR), vol. (A) 9, no. 10, 1967
(TR-61) Avail: NTIS

Aromatic polyimides - polymers possessing unusual technical properties - are produced in a two stage condensation polymerization reaction of the dianhydrides of the aromatic tetracarboxylic acid with the aromatic diamines. The first stage of the reaction is usually carried out in a strongly polar solvent (such as dimethylformamide, dimethylacetamide, dimethylsulfoxide, and others) at room temperature and produces a solution of polyamic acid. The second reaction stage, the imidization, consists of a chemical, or thermal treatment of the polyamic acid that had been precipitated from the solution. The thermal imidization in the solid phase is the fundamental practical method for the production of polyimides. Author

N71-31365 Cornell Univ., Ithaca, N.Y.
DIFFERENTIAL THERMAL AND ELECTRICAL CONDUCTIVITY STUDIES OF PHASE TRANSITIONS IN METAL-AMMONIA AND OTHER METAL-NONMETAL SYSTEMS
Pierre H. Chieux (Ph.D. Thesis) 1970 124 p
Avail: Univ. Microfilms Order No. 70-14375

Electrical conductivity was applied to the study of the liquid-liquid coexistence curve of sodium-ammonia solutions. An accuracy of 0.01 C was obtained around the critical temperature. The shape of the curve changed from parabolic to cubic at 1.7 C from T sub c. The beta critical coefficient was defined and was used to calculate the number of interacting centers. This was found to be at least 140. This value was then used for an estimation of the size of the concentrated clusters in the solution, 30 A to 60 A. Differential thermal analysis was applied to the detection of the metal-ammonia phase separation. A heat effect was detected but its broadness precludes use of the method. The same technique was then applied to phase transition studies on single microcrystals of WO3 and WO3-x. Studies on Li(x)V2O5 bronzes in the beta phase led to the discovery of phase transitions at -100 C for x = 0.40, 0.45, 0.49, and at -61C for x = 0.35. Dissert. Abstr.

N71-31368 Arizona Univ., Phoenix.
ISOTHERMAL BUBBLE MOTION UNDER THE INFLUENCE OF VARYING BODY FORCES
Dale Leonard Schrage (Ph.D. Thesis) 1970 218 p
Avail: Univ. Microfilms Order No. 70-15420

The two dimensional isothermal bubble motion under the influence of varying high-g body forces was investigated. Analytical and experimental results are reported for the velocities and trajectories of oxygen bubbles moving through distilled water and glycerin under the influence of a linearly varying body force. The results of formation are also presented. In addition, experimental and

analytical drag coefficients of planetary ellipsoidal bubbles moving through high M (high viscosity) liquids are presented as a function of the Weber and Reynolds numbers. The results for low gas flow rate isothermal bubble formation support the assertions that the volumes of bubbles formed at low gas flow rates are independent of the gas flow rate and are therefore only dependent upon the orifice configuration and the liquid properties. Dissert. Abstr.

N71-31375# Wisconsin Univ., Madison. Theoretical Chemistry Inst.

ANGULAR DISTRIBUTION OF THE SCATTERING OF Ar BY N2 AND Ne

K. G. Anlauf, R. W. Bickes, Jr., and R. B. Bernstein 11 Dec. 1970 11 p refs

(Grant NSF GB-16665)

(PB-197480; WIS-TCI-425X) Avail: NTIS CSCL 07D

Refined measurements of differential scattering of Ar with N2 are reported. Also summarized are results on Ar with Ne. The present observations substanitiate predictions of quenching of rainbow structure for an anisotropic potential. Author (GRA)

N71-31424*# North American Rockwell Corp., Downey, Calif. Space Div.

INVESTIGATIONS OF SOLID CHEMICAL BARIUM RELEASE SYSTEMS

D. T. Hodder, R. B. Kimball, and W. W. Wrinkle, Jr. Washington NASA Aug. 1971 65 p refs

(Contract NAS1-7000)

(NASA-CR-1739; SD70-333) Avail: NTIS CSCL 07D

An investigation of solid chemical (thermite) barium vapor release systems for geomagnetospheric measurements is reported. The relative barium vapor yield efficiency for the barium-copper oxide/canister system was evaluated as a function of varying physical parameters of the materials and release canister. Alternate solid chemical systems were investigated to increase the barium vapor yield efficiency. Tests were conducted under vacuum conditions. Primary measurements of relative barium release efficiency were obtained using a spectrometric technique in which relative intensities of Ba(o) and Ba(+) resonance emission lines were compared for each formulation or condition. A 75% barium-25% cupric oxide formulation was adopted as a standard for comparison since the formulation had successfully released Ba clouds in several flight tests. The results of the studies indicated that the yield of Ba vapor from the Ba-CuO systems was essentially insensitive to the parameters tested although some improvements were suggested. Two alternate unoptimized systems showed approximately 2 and 10 times better Ba vapor yields than the Ba-CuO standard mixture. The systems were respectively a barium-molybdic oxide mixture and one in which aluminum-molybdic oxide thermite vaporized a quantity of physically separated Ba granules. Hazards and safe handling of Ba and other reactive metals in combination with new chemicals is emphasized. Author

N71-31558# Canterbury Univ., Christchurch (New Zealand). Dept. of Chemistry.

GAS-PHASE REACTIONS OF ATOMS, RADICALS AND SIMPLE MOLECULES Final Scientific Report, 15 Feb. 1967 – 15 Feb. 1971

Leon F. Phillips 15 Feb. 1971 8 p refs

(Grant AF-AFOSR-1265-67)

(AD-722461; AFOSR-71-1065TR) Avail: NTIS CSCL 7/4

Literature references are given, and some results are described, for research on fast reactions of ground-state atoms with small molecules, on luminescent reactions of excited atoms, on matrix isolation spectroscopy, and on extreme ultraviolet photolysis. A new application of the phase-shift method of measuring the rates of fast reactions is described. Author (GRA)

N71-31587# Massachusetts Inst. of Tech., Cambridge.

[INSTRUMENTAL CHEMISTRY AND HOT ATOM CHEMISTRY] Progress Report, Period Ending 31 Dec. 1970

31 Dec. 1970 31 p refs

(Contract AT(30-1)-905)

(MIT-905-162) Avail: NTIS

A program to devise and explore new and improved methods and techniques for the measurement and characterization of chemical systems was studied to demonstrate the applicability and advantages of these methods for problems which are intrinsically important, and for which improved methods of measurement are particularly needed. A substantial portion of the work is related to environmental studies, particularly the detection and determination of the chemical characterization of trace constituents, both indigenous and foreign, in water and air. A study of the significant factors governing the use of anodic stripping voltammetry with mercury-coated graphite electrodes for determination of trace metals, particularly in sea water, was completed. Conditions for the accurate determination of heavy metals in sea water by anodic stripping voltammetry have been studied and the effects of intermetallic compound formation examined for copper, cadmium, bismuth, lead, thallium, indium, zinc, nickel and cobalt. A method for the direct determination of silver in sea water using anodic stripping voltammetry with waxed graphite electrodes was developed and applied to the analysis of representative sea water samples. The potential for determining other noble metals, particularly gold, in sea water was also explored. Author

N71-31597# Columbia Univ., New York.

METAL OXIDE INFRARED EMISSION Semiannual Technical Report, 30 Jun. – 31 Dec. 1970

Richard M. Zare 1971 24 p refs

(Grant DA-ARO(D)-31-124-70-G103; Arpa Order 1482-2)

(AD-723819) Avail: NTIS CSCL 7/4

Summarized is research dealing with the following topics: Reactions of magnesium, calcium, strontium, and barium with NO2 and N2O carried out under crossed beam conditions; A spectral study of the chemiluminescence from these reactions--in the case of Ba + NO2 the spectra was assigned to the A - X blue-green band system of the BaO emitter; and the Use of a new technique, namely, laser-induced fluorescence with application to the detection of vibrationally excited metal oxide molecules. Author (GRA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N71-30586# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

INFLUENCES OF QUANTIZATION PHASE SHIFT ERRORS ON RADIATION CHARACTERISTICS OF PLANE ANTENNA ARRAYS [EINFLUESSE VON QUANTISIERUNGSPHASENFEHLERN AUF DIE STRAHLUNGSCHARAKTERISTIK EBENER ANTENNENGRUPPEN]

G. Ries and W. Soentgerath Sep. 1970 28 p refs In GERMAN

Sponsored by Min. fuer Verteidigung

(Rept-4-70) Avail: NTIS

Electronically controlled antenna systems (phased arrays) using digital phase shifters show quantization sidelobes due to stepwise phase adjustment. These sidelobes can be avoided through random phase errors; their effects on plane arrays are statistically investigated. The resulting increase of the sidelobes is very small, and the errors in the main direction can be neglected. ESRO

N71-30688# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
APPROXIMATED GAUSS-MARKOV ESTIMATORS AND RELATED SCHEMES
J. L. Talmon (M.S. Thesis) Feb. 1971 63 p refs
(TH-71-E-17) Avail: NTIS

A discrete process, the output of which is disturbed by additive noise, is considered. The use of classical regression analysis for estimating the parameters of the process leads to, even asymptotically, biased estimates. To overcome this problem iterative schemes, based on the Gauss-Markov estimator, are discussed. To achieve good results with these schemes one has to estimate, in general, more parameters than strictly necessary for describing the process and the additive noise. Two schemes are derived for estimating a minimum number of parameters when a priori information is available. The results obtained with the different estimation schemes are good. Author (ESRO)

N71-30693*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMMUNICATION SATELLITE SYSTEMS FOR ALASKA
S. Gubin, H. Lavanhar, and A. Whalen Mar. 1971 193 p refs
(NASA-TM-X-65609; X-751-71-207) Avail: NTIS CSCL 17B

The technical and cost factors associated with the implementation of an Alaskan satellite system are examined. To determine a representative system configuration, it is necessary to analyze the current environment within which a system must operate and to generate requirements that the system will satisfy. An illustrative example is provided for the relative cost of such a system. A detail design requires refined and updated information from spacecraft and terminal manufacturers. A reasonably complete list of all in orbit and planned satellites is examined for applicability. A number of existing constraints that affect system selection and particularly the allocation of frequency are identified and discussed in terms of their influence on system design. Performance and approximate cost are analyzed to illustrate the tradeoffs necessary to achieve cost effective implementation and operation. Author

N71-30616# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
A TRACKING MODEL FOR ELECTRONIC RADAR [EIN SPURVERFOLGUNGSMODELL FUER ELEKTRONISCHES RADAR]
G. van Keuk Bonn Bundeswehramt 1970 53 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-70-5) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

An active tracking algorithm for Electronic Radar (ELRA) is formulated and described by statistical methods. By this strategy the ELRA can be used as a multifunction radar. The controller can tune a limiting volume of track accuracy for each tracked object separately so that the track accuracy will not cross the limit in the course of time. Author (ESRO)

N71-30626# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany). Abteilung fuer Fernmeldewesen.
VHF PROPAGATION MEASUREMENTS ON MIXED DIFFRACTION-SCATTER PATHS
R. Menzel and K. Rosenbach May 1970 12 p refs Presented at the 18th EPP/AGARD Symp., Duesseldorf, Sep. 1970 Sponsored by Federal Min. for Defence
(Rept-7-70) Avail: NTIS

The variation of radio link diffraction characteristics in dependence on reflection, pure diffraction, and fading is investigated. The propagation path is passing over hilly terrain, and the influence of meteorological factors is studied. ESRO

N71-30627# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
PULSE COMPRESSION FOR LONG DISTANCE RADAR. ANALYSIS AND PROCESSING OF BINARY PHASE MODULATED SIGNALS [IMPULSKOMPRESSION ZUR RADARFERNORTUNG. ANALYSE UND VERARBEITUNG BINAER PHASENGETASTETER SIGNALE]
J. Pahls (Ph.D. Thesis—Aachen Univ.) May 1970 99 p refs In GERMAN Sponsored by Bundesmin. fuer Verteidigung
(Rept-2-70) Avail: NTIS

The ambiguity functions of several signal types used in pulse compression for pulse Doppler radar are investigated and verified by an experimental model. The signal properties are evaluated using the ambiguity function applied to binary phase shifting, meeting the requirements of easy processing and sufficient resolution. ESRO

N71-30641# Ozeanographische Forschungsanstalt der Bundeswehr, Kiel (Germany).
MODEL TESTS FOR RECOMPRESSION OF DISPERSION DISTORTED SOUND SIGNALS IN SHALLOW WATER WITH INTERFERENCE BY SEA MOTION [MODELLVERSUCHE ZUR RUECKKOMPRESSION DISPERSIONSVERZERRTER SCHALLSIGNALE IM FLACHWASSER BEI STOERUNG DURCH SEEGANG]
W. Lenz and P. Wille Bonn Bundeswehramt 1971 35 p refs In GERMAN; ENGLISH summary Sponsored in part by Bundesmin. fuer Verteidigung and Fraunhofer Ges.
(BMVg-FBWT-71-3) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

The fluctuation of long wave sound signals in shallow water is investigated for CW and pulsed signals in a one dimensional model basin as a function of amplitude and period of surface waves. The signals broadened by dispersion are recompressed applying the time inversion method, and their fluctuations are measured with respect to energy and peak values as well as to the deformation of the envelope and the spectral variation. The fluctuations decrease with increasing spectral bandwidth of the signal within the ground mode and amounts to only a few dB even at wave heights as high as 10% of the water depth. The fluctuation has practically no influence on the halfwidth of the compressed signals. At wavelengths of the sound signals twice the length of the water surface wave maximum fluctuation occurs in connection with blind-damping (Bragg-reflection). In certain wavelength intervals there is a fluctuation minimum at a certain depth; above and below this depth the fluctuations have opposite phase. Author (ESRO)

N71-30717# Air Force Weapons Lab., Kirtland AFB, N.Mex.
THE APPLICATION OF EXTREME VALUE STATISTICS TO RADAR SYSTEMS EVALUATION Technical Report, 1 May 1967—1 Aug. 1969
Douglas W. Hill Mar. 1971 65 p refs
(AD-722441; AFWL-TR-70-78) Avail: NTIS CSCL 17/9

The technique of extreme value statistics (EVS) developed by Gumbel has been applied to the laboratory evaluation of radar systems. A computer program has been written using the EVS technique to provide false-alarm probabilities, confidence limits, and design information. Two test cases are included to provide a comparison of this technique with previous techniques. A set of plots for use in testing the applicability of the theoretical model to a given set of experimental data also are included. Author (GRA)

N71-31078# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
EVALUATION OF SPEECH TRANSMISSION CHANNELS BY USING ARTIFICIAL SIGNALS
T. Houtgast and H. J. M. Steeneken [1970] 40 p refs
(IZF-1970-33; TDCK-08713) Avail: NTIS

A method by which the effect of speech transmission channels on speech intelligibility can be quantified on the basis of simple physical measurements is presented. The time constant involved is about 8 sec, and the necessary, in terms of predicting the PB-word

score on a 0.7 probability level, is + or − 6% word score for common types of disturbances. The approach is based on the relationship of perceptual differences and physical differences among speech sounds. This relationship suggests that the effect of a transmission channel on intelligibility is strongly related to the degree to which the spectral differences, originated at the talker side, are preserved at the listener side. This leads to the definition of the speech transmission index (STI) based upon: (1) a simple artificial test signal by which a standard spectral difference is introduced at the talker side of the channel, and (2) an analyzing procedure to be applied to the test signal received at the listener side in order to quantify the degree of preservation of the spectral difference introduced. The test signal and the analyzing procedure are optimized on the basis of the rank-order correlation between the STI-values and PB-word scores obtained for 50 different transmission channels. The relation between the STI approach and other methods is discussed. Author

N71-31078# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DESCRIPTION OF STIDAS (SPEECH TRANSMISSION INDEX DEVICE BY USING ARTIFICIAL SIGNALS)
H. M. J. Steenekon and T. Houtgast [1970] 34 p refs
(IZF-1971-2; TDCK-50849) Avail: NTIS

A description is presented of the hardware of STIDAS, an apparatus developed for measuring the speech transmission index of communication channels by means of an artificial signal (measuring time below 3 seconds). Operation instructions and the way of interpreting the results are also given. Author

N71-31088# Ohio State Univ., Columbus. ElectroScience Lab.
[BORESIGHT ERROR OF THREE-DIMENSIONAL ANTENNA RADOME SYSTEMS] Final Technical Report, 1 Jan. 1970–31 Mar. 1971
David C. F. Wuand Roger C. Rudduck Mar. 1971 93 p refs
(Contract N00019-70-C-0252)
(AD-722634; Rept-2988-4) Avail: NTIS CSCL 17/9

The boresight error of a practical three-dimensional antenna-radome system is analyzed by the Plane Wave Spectrum-Surface Integration technique. The Plane Wave Spectrum formulation offers a very efficient method for calculating the near field of a large circular aperture antenna. The rest of the antenna-radome analysis is carried out by using plane wave transmission coefficients through the radome and employing a surface integration technique to calculate the pattern of the antenna in the presence of the radome. Author (GRA)

N71-31104*# TRW Systems Group, Redondo Beach, Calif.
CONSTRUCTION OF GENERAL PURPOSE PROGRAMS FOR THE NUMERICAL SOLUTION OF CERTAIN ELECTROMAGNETIC SCATTERING PROBLEMS
R. Mireles 28 Feb. 1969 34 p refs
(Contract NAS9-8166)
(NASA-CR-115084; TRW-11176-H092-R0-00) Avail: NTIS CSCL 20N

A computable electromagnetic theory model for the lunar reflectivity problem is presented. The problem is to construct the electromagnetic field reflected (scattered) by a very large target when a small portion of its surface is illuminated by an electromagnetic field of given description. Such a problem is an asymptotic form of certain classical scattering problems in which the target is completely illuminated by the incident field and in which the surface bounding the target is allowed to be more general than a sphere or an ellipsoid. The construction of general purpose programs for the numerical solution of these classical problems is discussed. Author

N71-31106*# TRW Systems Group, Redondo Beach, Calif.
A CLASS OF ELECTROMAGNETIC SCATTERING PROBLEMS SOLVABLE BY DEBYE'S REPRESENTATION
R. Mireles 14 Feb. 1969 142 p refs
(Contract NAS9-8166)
(NASA-CR-115083; TRW-11176-H122-R0-00) Avail: NTIS CSCL 20N

A tractable computer program for calculating the power scattered by a large, homogeneous body bounded by a smooth, undulated surface when it is illuminated by an incident field of finite extent is presented. Such a model provides the expected doppler spectrum for the velocity landing radar on the lunar module for certain deterministically rough lunar landing sites. The techniques used, however, are applicable to a very wide class of problems; therefore, it is desirable to maintain generality as long as possible. Author

N71-31117*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
CHARACTERISTICS OF A CIGAR ANTENNA
S. A. Brunstein and R. F. Thomas *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 87–95 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 09E

A cigar (metallic-disk-on-rod) antenna was investigated, because this type of antenna is physically thin and would have minimal effect on the radiation from the S-band feed horn. A cigar antenna design obtained using new phase velocity data is described. The phase velocity measurements were required when it was found that the available published data for disk-on-rod structures were in error. The new measurements and the experimental results obtained with the resulting design are also described. Author

N71-31118*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
IMPROVEMENTS IN DEEP SPACE TRACKING BY USE OF THIRD ORDER LOOPS
R. C. Tausworthe *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 96–106 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 17B

The characteristics of a simple third-order extension to second-order systems are discussed. That will not only extend their doppler-tracking capability, but will widen the pull-in range, decrease pull-in time, lower the voltage-controlled oscillator noise detuning when no signal is present, and lessen the susceptibility to voltage-controlled oscillator drift. Author

N71-31167*# Ohio State Univ., Columbus. Electroscience Lab.
A STUDY OF HIGH PERFORMANCE ANTENNA SYSTEMS FOR DEEP SPACE COMMUNICATION
Aug. 1970 75 p refs
(Grant NGL-36-008-138)
(NASA-CR-111941; Rept-2902-2) Avail: NTIS CSCL 09E

The most recently defined parameters for a high data rate of communication system which can operate between an earth station and a vehicle in space over great distances were studied. An effort is made to describe and delineate the characteristics of radiating subsystems and their internal subdivisions which can satisfy the requisite performance criteria for an S-band system. The advance technology concerned with the ground based antenna, and the spacecraft antenna are considered. An effort is made to determine the feasible design approaches for the ground antennas and their component parts. Appropriate design criteria are investigated analytically, and where possible a comparison is made with empirically determined results in an effort to define areas of research and development which need long term attention. Author

N71-31174# Ozeanographische Forschungsanstalt der Bundeswehr, Kiel. (West Germany).
MEASUREMENTS OF PROPAGATION ATTENUATION AND SPATIAL COHERENCE IN FLAT-BOTTOM WATER UNDER ROUGH SEA CONDITIONS [MESSUNGEN DER

AUSBREITUNGSDAEMPFUNG UND RAEUMLICHEN KOHAERENZ IM FLACHWASSER BEI HOHEM WELLENGANG]

Peter Wille Bonn Bundeswehramt 1971 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung

(BMVg-FBWT-71-4) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

Trinitrotoluene charges with pressure igniters were dropped from an airplane over a distance of 60 km in a smooth area of the North Sea. The acoustic signals generated were measured by a hydroplane array of 80 m length. Isothermal stratification of the water permits the determination of the propagation attenuation under rough sea conditions without being influenced by refraction anomalies. In addition, the spatial coherence of the signals was investigated.

ESRO

N71-31274# Joint Publications Research Service, Washington, D.C.

EFFECT OF PHOTOFILM NOISE IN OPTICAL PROCESSING SYSTEMS FOR SIGNALS FROM ANTENNAS WITH A SYNTHESIZED APERTURE

A. A. Bogdanov et al 23 Jul. 1971 17 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (Gorki), v. 14, no. 1, 1971 p 114–126

(JPRS-53670) Avail: NTIS

The limitations of dynamic range, the number of distinguishable levels of signal intensity, and the deterioration of resolving power are examined. These phenomena are caused by photofilm noise during optical conversion of signals recorded on photofilms in radar systems with a synthesized aperture. Measurements of the above phenomena and applications of results to holography are discussed.

Author

N71-31291# Pennsylvania State Univ., University Park. Ionosphere Research Lab.

AN ANALYSIS OF THE WAVE INTERACTION DISTURBING ANTENNA SYSTEM

M. J. Fithian 31 Jan. 1971 114 p refs

(Grant NSF GA-1456)

(PB-197827; SR-367) Avail: NTIS CSCL 09E

An analysis of the wave interaction disturbing antenna system is presented. The system is a linear, broadside array of 1.3 wavelength elements with .5 wavelength parasitic directors. It is designed to operate at a frequency of 4.5 MHz. The theoretical radiation patterns of the array are derived and plotted for the designed frequency and the second and third harmonics. Using a scale model, the radiation patterns are obtained experimentally for the three frequencies. Various modifications are made on the model which simulate the same changes on the full-scale system. These changes were made to test whether the existing system could be improved. At the harmonics, it was found that the side lobes increase and that most of the energy is radiated off the vertical. A marked improvement in the beamwidth and side-lobe level of the system at the fundamental occurred if reflectors were used with the driven elements.

Author (GRA)

N71-31311*# Techtran Corp., Glen Burnie, Md.

MEAN QUADRATIC ANGLES OF INCLINATION OF THE SURFACES OF VENUS [SREDNEKVADRATICHNYYE UGLY NAKLOVA POVERKHNOSTI VENERY]

N. N. Krupenio et al Washington NASA Jul. 1971 24 p refs Transl. into ENGLISH from Russian report Pr-49

(Contract NASw-2037)

(NASA-TT-F-13741; Pr-49) Avail: NTIS CSCL 20N

Diagrams of the back-scatter of Venus measured in the course of radio location of that planet from the earth in the centimeter and decimeter ranges are examined. Taking into account chemical composition and the temperature and pressure level profiles that were secured during the course of experiments on the interplanetary stations Venus 4, Venus 5, Venus 6, and Venus 7, a calculation of the weakening and refraction of radio waves in the atmosphere of the planet was carried out. This made it possible to draw diagrams of the backscatter of the surface of Venus and to compute the mean quadratic angles of inclination of the surface.

Author

N71-31328*# Scientific Translation Service, Santa Barbara, Calif.

METEOSAT: PCM FRAME TRANSMISSION FORMAT DEFINITION [METEOSAT: TRANSMISSION PCM DES IMAGES DEFINITION DU FORMAT]

Washington NASA Jan. 1971 35 p refs Transl. into ENGLISH from the French report 533/CB/ES/E

(Contract NASw-2035)

(NASA-TT-F-13830; Rept-533/CB/ES/E) Avail: NTIS CSCL 14E

The PCM transmission of satellite photographs is analyzed. Several possible coding schemes are evaluated. A single synchronization code per line with an alternating and nonalternating code is considered.

Author

N71-31368# Virginia Univ., Charlottesville. Industrial Research and Development Center.

POST MIXER SPECTRA OF PERIODIC FM ALTIMETERS WITH AREA TARGET RETURNS. SUPPLEMENT 1 Final Report

G. A. McAlpine, J. F. Dammann, J. H. Highfill, and J. C. Isaacs Apr. 1971 36 p refs

(Contract DAAG39-68-C-0014)

(AD-722823; IRDC-3378-111-65U-Suppl-1) Avail: NTIS CSCL 17/9

A periodic fm altimeter is postulated and its illuminated area target modeled as an array of elemental scatterers. A computational form is then developed expressing the desired post mixer spectrum as a sum of spectral components corresponding to the individual scatterer returns. Application of the model is made to the case of a triangular linear sweep fm altimeter and parametric studies of the calculated post mixer spectrum presented, illustrating the effects of antenna beam geometry, target surface properties and modulation parameters.

Author (GRA)

N71-31367# Naval Postgraduate School, Monterey, Calif.

ELIMINATION OF IMPULSE NOISE INTERFERENCE FROM COMMUNICATIONS RECEIVERS BY THE RF BLANKER METHOD

Warren Aubrey Norman (M.S. Thesis) Dec. 1970 53 p refs

(AD-722563) Avail: NTIS CSCL 17/2

The feasibility of a simple add-on noise blanker for use in the HF range is investigated. Various types of noise blankers are reviewed and the advantages of operating at RF as opposed to IF are established. Performance of gate circuits of varying complexity using PN junction and Hot Carrier diodes is evaluated. To demonstrate the potential of this type of blanker, a simple experimental model is constructed and tested. An improvement in S/N ratio of up to 60 db is obtained for weak signals masked by impulse noise.

Author (GRA)

N71-31363# Stanford Univ., Calif. Electronics Lab.

ANGLE AND DOPPLER MEASUREMENTS OF MICROWAVES PROPAGATED BEYOND THE HORIZON

Nicholas Cianos Fort Monmouth, N.J. ECOM Apr. 1971 154 p refs

(Contract DAAB07-70-C-0138)

(AD-722808; SU-SEL-70-060; ECOM-0138-4503-1; TR-4503-1) Avail: NTIS CSCL 20/14

The report presents results of angle and doppler measurements of the specular and scattered components of transhorizon signals. The transhorizon signal measurement are recorded on a vertical 12-element data-gathering array and receiving system. The array measures the relative phase and amplitude along the wavefront of

an S-band CW signal transmitted from a source 164 km (102 miles) away--well beyond the horizon. The data are processed to obtain the amplitude distributions, averaged array angular-response patterns, and doppler spectra. In addition, the radio data are supplemented with airborne refractivity and temperature--profile measurements. Two unique features of this work are described. First, the doppler frequency spectrum of the received signal is evaluated from the sampled amplitude and phase information, and second, the amplitude distributions and doppler spectra are evaluated for the received signal at a single antenna element or for a conventional broadside array. Consequently, the distributions and spectra are available as a function of the array beam-pointing angle. Author (GRA)

N71-31364# Stanford Univ., Calif. Electronics Labs.
ADVANCED RESEARCH IN PROPAGATION TECHNIQUES Final Report, 20 Feb. 1970 - 19 Feb. 1971
Alan T. Waterman, Jr. Apr. 1971 18 p refs
(Contract DAAB07-70-C-0138)
(AD-722807; SU-SEL-71-010; ECOM-0138-F) Avail: NTIS CSCL 20/14

The report summarizes briefly the work performed under the subject contract on the use of a wave-front sampling antenna array in beyond-the-horizon propagation measurements. CW signals from a stable 3 GHz source are transmitted over a 102-mile transhorizon path. At the receiving site, an array of twelve spaced antenna elements is used to sample the arriving wave front. Amplitude and phase at each element are sampled in near simultaneity and stored on digital magnetic tape. The processed data are then presented in various forms: antenna scans in angle-of-arrival, doppler spectrum of the signal as received on one antenna element, doppler spectrum of the signal as received on the array of elements when phased so as to point in particular directions, distribution of signal level, and space correlation of the received signal. These processed data are then interpreted in terms of a flexible model of atmospheric structure. The model contains two component parts: a distributed turbulent structure which scatters the wave incoherently with a scattering cross section which varies inversely as some power of the scatter angle, and a stratified layer structure which reflects the wave coherently. The analysis permits a quantitative evaluation of the role played by these two processes. Meteorological measurements with an airborne microwave refractometer help confirm the interpretation. Author (GRA)

N71-31518# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
ON THE ABSORPTANCE OF CAVITY-TYPE RECEIVERS
Jon C. Geist and Joseph C. Richmond Jul. 1971 39 p refs
(NBS-TN-575) Avail: SOD $0.45

The directional-hemispherical reflectance of a number of flat samples that were coated with Parsons Optical Black Lacquer was measured at 0.6328 and 1.15 micrometers with a laser source integrating sphere reflectometer. The reflectance varied significantly with method of application, and was significantly higher for the Eppley lacquer than for the Parsons lacquer. The reflectance of two cavity receivers, one coated with each lacquer, was also measured. The measured reflectance of the Parsons cavity was appreciably higher than that computed from the measured reflectance of the lacquer and the geometry of the cavity. Retroreflectance measurements revealed that both lacquers reflected more radiant energy back into directions near the direction of incidence than would a perfect diffuser of the same directional-hemispherical reflectance, but the Parsons lacquer was by far the more pronounced retroreflector. Author

N71-31568# RAND Corp., Santa Monica, Calif.
TRANSPOLAR PROPAGATION OF LONG RADIO WAVES
E. C. Field, C. Greifinger, and K. Schwartz Mar. 1971 40 p refs
(Contract DASA01-71-C-0012)
(AD-723822; R-683-DASA; DASA-2621) Avail: NTIS CSCL 20/14

The report presents the results of a theoretical analysis and a laboratory simulation of certain transpolar VLF/ELF propagation phenomena. The calculations are based on daytime ionospheric models representative of ambient conditions and of conditions which prevail during polar cap absorption (PCA) events. The laboratory simulation utilized a waveguide which models VLF propagation in the earth-ionosphere cavity. The influence of the Greenland icecap is included in both the theoretical and experimental approaches. GRA

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics

N71-30453# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.
COMPUTER PROGRAM FOR EVALUATION OF PULSATION EXPERIMENTS [PROGRAM PRO VYHODNOCENI PULSNICH EXPERIMENTU]
C. Svoboda [1970] 10 p refs In CZECHOSLOVAKIAN
(UJV-2381.RF) Avail: AEC Depository Libraries

Formulas referring to background and measurement errors in pulsation experiments and to reactivity calculations by the Gozani and Garelis-Russel method are given. Program 1355/U devised for evaluation of pulsation experiments is briefly described. NSA

N71-30484# European Organization for Nuclear Research, Geneva (Switzerland).
PROCEEDINGS OF THE 1970 CERN COMPUTING AND DATA PROCESSING SCHOOL
1971 469 p refs Conf. held at Varenna, Italy, 30 Aug.-12 Sep. 1970
(CERN-71-6) Avail: AEC Depository Libraries

Topics include programming languages, simulation in computer design, data processing in bubble chamber experiments, the impact of computers on nuclear science, computer graphics, integrated cognitive systems-perspectives for the 1970's, on-line experiments in high energy physics, data structures, algebraic manipulation, and simulation in high energy physics. NSA

N71-30506# Bendix Corp., Kansas City, Mo.
COMPUTER AIDED TEST SYSTEMS
J. A. Walters Dec. 1970 197 p refs
(Contract AT(29-1)-613)
(BDX-613-275) Avail: NTIS

A handbook is presented for providing the test-system engineer with the background for assessing the applicability of a minicomputer to a specific test design. Topics presented include: basic concepts in computer programming, advantages of computer programming, and minicomputer comparisons. A check list of factors to consider relative to computer utilization is also included. F.O.S.

N71-30520# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).
FAILURE DETECTION [DETECTION DES PANNES]
J. P. Richard Mar. 1971 16 p In FRENCH
(LAAS-G-3-E-1; NI-771) Avail: NTIS

Assuming that the only failures that can occur in a logical circuit are that some gates may remain either opened or closed, an algorithm is developed for automatic failure analysis. ESRO

N71-30588*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THEORY AND APPLICATION OF AN EDGE GRADIENT SYSTEM FOR GENERATING OPTICAL TRANSFER FUNCTIONS

Edwin Klingman Washington Jul. 1971 21 p refs

(NASA-TN-D-6424; M-441) Avail: NTIS CSCL 09B

A system has recently been developed that is capable of measuring optical transfer functions quite accurately. The theory, system description, computer program, and instructions necessary to use this system for practical measurements is described and results of the measurements made by the system are also discussed. The modulation transfer functions generated by the system are extremely useful for comparing loss of resolution through optically contaminated quartz flats. Absolute measurements have not been made, however results indicate quite good accuracies are obtainable. For comparative measurements, the system is superb. Author

N71-30589# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Teoreticheskoi i Eksperimental'noi Fizik.

SYSTEM FOR THE TRANSMISSION OF DATA FROM THE ANALYZER INTO THE COMPUTER [SISTEMA PEREDACHI INFORMATSII IZ ANALIZATORA IMPUL'SOV V VYCHISLITEL'NUYU MASHINU]

V. V. Zhurkin, O. E. Mikhailov, V. I. Pribytov, and O. V. Rykov 1970 16 p refs In RUSSIAN; ENGLISH summary

(ITEF-779) Avail: AEC Depository Libraries

A system for the transmission of data from the pulse analyzer AI-4096-3B into the computer Razdan-3 is described. An interrupt mode is used for the recording of the data. The data may be recorded either by the core memory or on magnetic tape. In either case the recording may be combined with the calculation. The number of transmitted words and their arrangement in memory of the computer are indicated in a program. The system is used for the transmission of the data generated by the flying spot device. Author (NSA)

N71-30603# Karlsruhe Univ. (West Germany). Inst. fuer Nachrichtenverarbeitung und Nachrichtenuebertragung.

INVESTIGATIONS OF ADAPTIVE SYSTEMS AND SELF-CORRECTING CIRCUITS [UNTERSUCHUNGEN UEBER ADAPTIVE SYSTEME UND SELBSTKORRIGIERENDE SCHALTUNGEN]

J. Beister, W. Goerke, H.-J. Hoenerloh, W. Menzel, D. Schmid et al Bonn Bundeswehramt 1970 150 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung (BMVg-FBWT-70-4) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

Adaptive linear classifying structures are realized and nonlinear adaptive schemes are simulated by computer. A general theory of learning systems is developed. Basic self-correcting circuits with error diagnostic option and redundant circuits with an adaptive majority decision are described. Some results of the primary work on picture processing are demonstrated. Author (ESRO)

N71-30609*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE NASTRAN HYDROELASTIC ANALYZER

James B. Mason Mar. 1971 58 p refs

(NASA-TM-X-65617; X-321-71-174) Avail: NTIS CSCL 09B

An overview of the NASTRAN hydroelastic analyzer computer program is given. Included is a theoretical derivation showing general assumptions and procedures used in obtaining the finite element model of the hydroelastic problem. Program implementation of the theory is discussed, and an appendix showing a comparison between NASTRAN and theoretical results is attached. Author

N71-30610*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SGINDEX: AN OS/360 SYSTEM GENERATION CROSS-REFERENCE INDEX

C. Wrandle Barth Jun. 1971 49 p

(NASA-TM-X-65611; X-603-71-249) Avail: NTIS CSCL 09B

In almost all kinds of system programming under OS/360 it is necessary to extract information from the sysgen listing. This is true whether one is modifying OS, applying PTF's, or writing subsystems which interface with OS. A need for an easy-to-use but comprehensive cross-reference index of the sysgen is considered. SGINDEX is a program which collects key data from the Stage II input for an OS/360 sysgen, sorts it, and prints a formatted listing of the index entries collected. Several optional features have been included in SGINDEX which can be requested via the EXEC card parameter. SGINDEX uses a region of about 200K in an MVT environment, although this may be decreased by compiling with OPT=0. The program is written in PL/I and requires SYS1.PL1LIB for linkage editing. Since the OS sort package is used, SYS1.SORTLIB is required at run time. Using OPT=1, a large release 19 sysgen was run in slightly over 3 minutes on a 360/75J. Author

N71-30611*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A LIST PROCESSING SUBROUTINE PACKAGE FOR THE IBM 1800/1130

Gerald A. Muckel Jul. 1971 47 p refs

(NASA-TM-X-65622; X-711-71-288) Avail: NTIS CSCL 09B

Some of the fundamentals of list processing techniques are presented. In addition to this introduction to list processing, a set of subroutines written for the IBM 1800/1130 that provide a base upon which the user can build a list processing capability is described. A demonstration of an information storage and retrieval system which shows a typical use of these subroutines in a list processing environment is also included. Author

N71-30630# Norges Tekniske Hoegskole, Trondheim. Elektronikklaboratoriet.

WIRING PROGRAM "LISS-2": USERS MANUAL [TRAEDNINGSPROGRAMMET "LISS-2": BRUKERINSTRUKS]

H. Soerbye and A. Walla 2 Nov. 1969 77 p refs In NORWEGIAN; ENGLISH summary Sponsored by Roy. Norweg. Council for Sci. and Ind. Res.

(ELAB-IT-135) Avail: NTIS

"LISS" user can choose the number of list types he wants. It is based on the modular structure in digital systems and starts with data set describing the modules as seen from the terminals. Data can be written directly from block diagrams or from lists for each module using signal names as the wire identifier. There are two main aspects of the program, a development aspect, which may be used for checking the formal interconnection, and a production aspect giving the emplacement list, a mounting list, and changes from earlier models. The program allows easy correction of data from earlier runs and includes extensive check routines for all items which can be checked without going into detailed parts in the internal functions of the modules. LISS allows a subdivision of the system with free choice of signal names within a subsystem and interconnection between subsystems by equivalence statements. Author (ESRO)

N71-30642# Norwegian Computing Center, Oslo (Norway).

THE "WATER 3" PROGRAM SYSTEM: USERS MANUAL [PROGRAM-SYSTEMET "WATER 3": BRUKER INSTRUKS]

Gustav Sverdrup-Thygeson 1 Sep. 1969 79 p In NORWEGIAN; ENGLISH summary

Avail: NTIS

The Norwegian Data Center has for some time been dealing with development of computer programs for the solution of a distribution network with special emphasis on water supply. The method chosen is a modified model of Newton-Raphson iteration method. By this method the computer program generates a linear set of equations which is set up in matrix form and solved by using the block Gauss-Seidel over-relaxation method with each iteration. ESRO

N71-30657# Lund Univ. (Sweden). Dept. of Physics.
COMPUTER PROGRAMME FOR CALCULATION OF SOLID ANGLES AND ANGULAR ACCEPTANCES
Toeivelemb Kivikas Sep. 1970 75 p ref
(LUSY-7007) Avail: AEC Depository Libraries

SOLAN, a FORTRAN program, for the calculation of solid angles and angular acceptances relevant to commonly-encountered target-detector geometries is described. Some illustrations of typical calculations are given as a listing appendix of the program. Author (NSA)

N71-30673# Karlsruhe Univ. (West Germany). Inst. fuer Nachrichtenverarbeitung und Nachrichtenuebertragung.
DESCRIPTION OF A COMPUTER SYSTEM FOR PICTURE PROCESSING AND SOME METHODS FOR AUTOMATIC PICTURE RECOGNITION [BESCHREIBUNG EINES COMPUTERSYSTEMS ZUR BILDVERARBEITUNG UND EINIGE METHODEN ZUR AUTOMATISCHEN MUSTERERKENNUNG]
B. Fink, R. Hartenstein, F. Holdermann, R. Schaerf, M. Sties et al Bonn Bundenswehramt 1970 221 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-70-3) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

The structure of a computer for photographic processing and the driver routines for the developed special equipment are described. In connection with preprocessing patterns, grey-level picture scanning, local, and global picture processing is dealt with. Programming aids for local processing, pattern classifying by threshold logic, cascading, and synthesizing of finite state automata for classifying and preprocessing patterns, are described. ESRO

N71-30709# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE ANALYSIS AND CLASSIFICATION OF RANDOM APERIODIC SIGNALS
Charles F. Hall (M.S. Thesis) Mar. 1971 118 p refs
(AD-722647; GE/EE/71-11) Avail: NTIS CSCL 9/2

Two classes of random aperiodic signals were analyzed using one- and two-dimensional Fourier transforms. Low-frequency filtering in the transform domain and the Euclidean distance metric were used to classify signals in one of the two classes. Linear decision boundaries, clustering algorithms, and a training algorithm using a linear categorizer were also used during the analysis. It was found that low-frequency spatial filtering in the two-dimensional Fourier-transform domain gave complete separation of the two classes of signals analyzed. Author (GRA)

N71-30755*# TRW Systems Group, Redondo Beach, Calif.
IMPROVED NEUTRON ACTIVATION CODE SYSTEM DEVELOPMENT, PHASE A
R. W. Webb, R. M. Saqui, J. D. Gordon, and R. H. Karcher 20 Nov. 1970 161 p refs
(Contract NAS8-25586)
(NASA-CR-61356; TRW-17052-6001-R0-00) Avail: NTIS CSCL 09B

The results of an effort in which applicable computer codes were identified, reviewed, and evaluated for inclusion into the INAP system are summarized. From these results recommendations are made for the development and improvement of the INAP code system. Author

N71-30796*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER ACQUIRED PERFORMANCE DATA FROM A PHYSICALLY VAPOR DEPOSITED TUNGSTEN, NIOBIUM PLANAR DIODE
Richard B. Lancashire Washington Jul. 1971 22 p refs
(NASA-TM-X-2330; E-6282) Avail: NTIS CSCL 09B

Performance data from a physically vapor-deposited-tungsten, niobium thermionic converter are presented. The planar converter has a guard ringed collector and a fixed space of 0.254 mm (10 mils). The data were acquired by means of a computer, and are available on microfiche as individual or composite, parametric J, V curves. The parameters are the temperatures of the emitter, T sub E, collector, T sub C, and cesium reservoir, T sub R. The composite plots have constant T sub E and varying T sub C or T sub R, or both. The envelope and composite plots having constant T sub E are presented. The diode was tested at temperature increments between 1500 and 2000 K for the emitter, 765 and 1057 K for the collector, and 521 and 652 K for the reservoir. In all, 432 individual current, voltage curves were obtained. Author

N71-30857*# National Aeronautics and Space Administration, Washington, D.C.
POTENTIAL POSSIBILITIES OF COMPRESSION OF INFORMATION IN CERTAIN SYSTEMS OF DATA PROCESSING [POTENTSIALNYYE VOZMOZHNOSTI SZHATIYA INFORMATSII NEKOTORYKH SISTEM OBRABOTKI DANNYKH]
Yu. K. Khodarev et al Jul. 1971 18 p refs Transl. into ENGLISH of Acad. of Sci. USSR, Inst. for Space Res., Moscow, report Pr-24
(NASA-TT-F-13790; Pr-24) Avail: NTIS CSCL 09B

The composite parts of the compression coefficient in the system of data processing are determined. Certain methods are considered of introducing the overhead information into the telemetric frame of the system. It is shown that there exists a common recording of the formation algorithm of the compressed frame. The minimum and maximum limits are found for the real coefficient of compression of the frame for any value of active channels in the frame and the dependence is shown of the potential possibilities of compression on the method of introduction of overhead information into the frame. The form of extreme distributions of the probability of the number of active channels in the frame is determined. The results of comparison of experimental estimates and of the real value of the coefficient of compression computer according to the telemetric information from a series of long range spacecrafts are presented. Author

N71-30865# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
STUDY RELATING POSSIBILITIES OF AUTOMATIC IDENTIFICATION AND DISCRIMINATION ON THE BASIS OF SIZE, COLOUR AND TEMPERATURE [STUDIE BETREFFENDE MOGELIJKHEDEN VAN AUTOMATISCHE INDENTIFICATIE EN DISCRIMINATIE OP GROND VAN AFMETINGEN, KLEUR, EN TEMPERATUUR]
A. N. de Jong Sep. 1970 23 p refs In DUTCH; ENGLISH summary
(PHL-1970-23; TDCK-56995) Avail: NTIS

Electronic photointerpretation is discussed including automatic identification and discrimination by size, color, and temperature. The design of a reconnaissance system utilizing in a multispectral sensor is considered. Several parameters are covered including visible and near infrared reflection coefficients for passive natural illumination and active laser illumination; thermal infrared radiation; and continuous height measurement using a modulated laser beam. J.M.

N71-31081*# Scientific Translation Service, Santa Barbara, Calif.
PROBLEMS ASSOCIATED WITH THE GRAPHIC INTERACTION OF OPERATOR-COMPUTER [PROBLEMI CONNESSI CON L'INTERAZIONE GRAFICA OPERATORE-CALCOLATORE]
I. De Lotto Washington NASA Nov. 1970 22 p refs Transl. into ENGLISH of Centro Informazioni Studi Esperienza, Milan, report CISE-115
(Contract NASw-2035)

(NASA-TT-F-13816; CISE-115) Avail: NTIS CSCL 09B

An IBM computer with 16,000 memory positions of 16 bits each and a memory cycle of 2 microseconds is described as well as its equipment and a graphic display unit. Programs and programming techniques for graphic display are outlined. The solutions to man-machine interface problems including the planning and detailed description of definite objects with double curved surfaces; computer interpretation of alphanumeric characters and electrical symbols hand-traced on the screen by the operator; analysis of electronic circuits; and resolution of partial differential equations are reported. The internal structure of an idea; simulation of an analog computer; iterative analysis and synthesis of block diagrams for linear systems; operator-computer interaction during data acquisition and processing for physics experiments; and architectural applications are cited as unsolved problem areas. J.M.

N71-31114*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.

RESEQUENCING OF THE STRUCTURAL STIFFNESS MATRIX TO IMPROVE COMPUTATIONAL EFFICIENCY

R. Levy *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 61-70 refs (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 09B

Improved computational efficiency and reduction in core storage requirements in large-capacity structural-analysis computer programs are achieved by taking advantage of the typical sparseness in the stiffness matrix. In many cases, the favorable effects were enhanced by resequencing the interconnecting terms of the stiffness matrix. This produced a relatively large empty region that can be bypassed and a small, compact region that is moved into the core for computations. A favorable alternative resequencing procedure that has the goal of reducing the matrix wavefront is described. Comparisons are supplied to show the relative compactness that can be achieved for practical structural models with wavefront sequencing and with bandwidth sequencing. Examples show that wavefront sequencing can produce a savings in the time required for subsequent decompositon of the stiffness matrix. Author

N71-31168 Clemson Univ., S.C.

THE DESIGN OF OPTIMAL CONTROL SYSTEMS FOR MULTIVARIABLE PROCESSES BY DIRECT SEARCH

John Irving Elsey (Ph.D. Thesis) 1969 321 p

Avail: Univ. Microfilms Order No. 70-17444

An investigation was undertaken to determine the feasibility of using one of the direct search optimization techniques in the optimization of the performance of multivariable process control systems. A simple optimization scheme with Partan as its basis was devised and tested. Partan was tested alone at first to insure its generality and adequate performance on surfaces containing saddle points, ridges, discontinuities, etc. The Partan program was combined with a digital simulation of the multivariable control system under study to yield the desired optimization scheme. The optimization scheme, known as the Jason procedure, was first tested using a single-loop control system. The Jason procedure was tested using a hypothetical multivariable control system whose parameters were highly constrained. The results indicate that Partan may be used effectively in a simple scheme which calculates optimum parameter values for constrained multivariable process control systems. Dissert. Abstr

N71-31290# Massachusetts Inst. of Tech., Cambridge.

TRANSMISSION OF INFORMATION BETWEEN A MAN-MACHINE DECISION SYSTEM AND ITS ENVIRONMENT

Douglas M. Wells Apr. 1971 11 p refs

(Contract N00014-69-A-0276-0002)

(AD-722837; MAC-TM-22) Avail: NTIS CSCL 5/10

The paper describes the structure of the external communication facilities of a highly-interactive information system designed to assist a user in making non-trival decisions. The report also examines the usefulness of functional modularity and specification of canonical form interfaces as an aid in the comprehension of the interaction of the various modules of a complex system. The areas of external communication defined and examined are: data collection, process management, report generation, and facilities management. Author (GRA)

N71-31292# Ohio State Univ., Columbus. Computer and Information Sciences Research Center.

OPTIMAL PREFIX CODES FOR ENSEMBLES OF N EQUIPROBABLE MESSAGES USING A BINARY ALPHABET

Kent N. Haralson and Lee J. White May 1970 109 p refs

(Grant NSF GN-534.1)

(PB-197642; OSU-CISRC-TR-70-8) Avail: NTIS CSCL 09D

The work of Varn and Schlesinger is reviewed and is finalized the algorithm to obtain a set of optimal trees representing the prefix code words for N messages is finalized and the set characterized. A program for generating the optimal set of trees and for analyzing them is presented. The optimal set of trees and how they are generated for an ensemble of N messages for N = 2,3,...12,13 is included. The case of equiprobable messages and unequal costs with a binary alphabet and equal costs and nonequiprobable messages are characterized. Author (GRA)

N71-31329# Joint Publications Research Service, Washington, D.C.

ALGORITHMS OF PRELIMINARY DATA PROCESSING IN THE VISUAL SYSTEM

A. A. Petrov 21 Jul. 1971 10 p refs Transl. into ENGLISH from Biofizika (Moscow), v. 16, no. 3, 1971 p 512-519

(JPRS-53644) Avail: NTIS

Synthesis of optimal algorithms of signal processing is used in investigation of the functional organization and priciples of operation of sections of the nervous system. A model is developed and the optimal algorithm of receptor signal processing is synthesized for neutron ensembles of the visual analyzer. The optimal algorithm is compared with the operation of actual neutron cell ensembles of the visual analyzer. Author

N71-31343# Naval Postgraduate School, Monterey, Calif.

A COMPUTER SIMULATION ANALYSIS OF A SUGGESTED APPROXIMATE CONFIDENCE INTERVAL FOR SYSTEM MAINTAINABILITY

Carl Flack Logan (M.S. Thesis) Mar. 1971 38 p refs

(AD-722565) Avail: NTIS CSCL 12/2

The paper presents an accuracy analysis of a suggested approximate confidence interval for system maintainability parameters. Technically, the simulation demonstrates feasible ranges of parameter applicability for a fit of linear combinations of generated gamma variates to the gamma distribution, using the method of moments. The simulation has application to the classical confidence interval for mean time to repair of a series system, under the assumptions of gamma distributed repair times, and method of moments estimators. Author (GRA)

N71-31344# Naval Postgraduate School, Monterey, Calif.

AN ALGORITHM FOR OPTIMIZATION OF CERTAIN ALLOCATION MODELS

Paul Theodore Zmuida (M.S. Thesis) Mar. 1971 60 p refs

(AD-722584) Avail: NTIS CSCL 12/2

The paper discusses the nature of allocation problems. The Danskin Algorithm for the solution of a convex function to be minimized over a closed convex set is developed. An example of an application involving the solution of a 3600 variable allocation problem using a computer is provided. The paper includes analysis of the solution and a discussion of problems encountered in the computer application. Author (GRA)

N71-31345# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN AUTOMATIC PLOTTER FOR USE WITH A COMPUTER

V. T. Gilenko et al 8 Feb. 1971 15 p refs Transl. into ENGLISH from Vopr. Tekh. Ekspluatatsii Vychislitelnykh Mashin (USSR), no. 2, 1969 p 68-76

(AD-722820; FTD-MT-24-338-70) Avail: NTIS CSCL 9/2

The article is devoted to a description of an automatic plotter designed for operation with the M-20 digital computer. The technical specifications of the plotter are presented. Its design is described in brief. The coupling of the plotter to the M-20 computer and the sub-program for reference to the plotter are described in detail. Author (GRA)

N71-31346# Texas Univ., Austin. Dept. of Electrical Engineering.

JOINT DETECTION, ESTIMATION AND SYSTEM IDENTIFICATION

D. G. Lainiotis Apr. 1971 30 p refs

(Grant AF-AFOSR-1764-69; AF-AFOSR-1792-69)

(AD-722460; AFOSR-71-0948TR) Avail: NTIS CSCL 9/4

Recent results of Middleton and Esposito and Lainiotis on single-shot joing detection-estimation for discrete data are extended to the single-shot continuous data case and generalized to joint Bayesian detection-estimation - system identification. Specifically, it is shown that the above problem constitutes a class of nonlinear mse estimation problems, with the attendant difficulties in realizing the optimal nonlinear estimators. However, by utilizing the adaptive approach closed form integral expressions are given. These are given in terms of the generalized likelihood ratio Lambda(t), which is a sufficient statistic for Bayes-optimal compound detection. The latter in turn is specified by a continuum (for continuous theta) theta-conditional likelihood ratious Lambda(t/theta) each of which is the LR for testing for the model specified by the parameter value theta. The latter LRs are, moreover, given in terms of optimal mse causal estimators. In essence then, it has been shown that system identification is equivalent to multihypothesis testing, with a continuum or finite sequence of hypotheses, respectively for continuous or finite discrete range of theta. Author (GRA)

N71-31347# Naval Postgraduate School, Monterey, Calif.

AIRCRAFT DATA ACQUISITION SYSTEM FOR ACADEMIC FLIGHT EVALUATION

William Lansing Vincent (M.S. Thesis) and Alexander Martin Phillips (M.S. Thesis) Mar. 1971 76 p refs

(AD-722583) Avail: NTIS CSCL 14/2

Various methods for investigating the stability and control characteristics of the US2A were considered in obtaining a system that would provide a proper degree of data accuracy, data availability and system reliability yet still be instructional and functional. To this end, a photo-panel system with its various input systems was designed and incorporated into the Aeronautics Departments US2A, BUNO 136533. Installation and component check-out of this photo-panel system was achieved. Author (GRA)

N71-31370*# California Univ., Los Angeles. School of Engineering and Applied Science.

PROTOTYPE CONSTRUCTION OF A COMPILER FOR NETWORK ANALYSIS FEASIBILITY STUDY

David F. Martin, Lawrence P. McNamee, Richard Chen, and David Patterson Sep. 1970 114 p

(Contract NAS12-2104)

(NASA-CR-119863; UCLA-ENG-7041) Avail: NTIS CSCL 09B

The feasibility of designing and implementing a circuit design system capable of integrating many circuit analysis packages through a common input language was investigated. Progress in this study includes completion of the circuit design language, an operational compiler, and the implementation and testing of a version of the entire circuit design system. Presently the only circuit analysis package included in the system is CIRCUS, however, the inclusion of additional packages presents no conceptual difficulty and will require only minor programming effort. Author

N71-31371*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

A STATISTICAL TECHNIQUE FOR COMPUTER IDENTIFICATION OF OUTLIERS IN MULTIVARIATE DATA

Ram Swaroop and William R. Winter Washington Aug. 1971 30 p refs

(NASA-TN-D-6472; H-657) Avail: NTIS CSCL 09B

A statistical technique and the computer program for editing multivariate data are presented. The technique is particularly useful when large quantities of data are collected and the editing must be performed by automatic means. One task in the editing process is the identification of outliers, or observations which deviate markedly from the rest of the sample. A multivariate analog is discussed which considers the statistical linear relationship between the variables in identifying the outliers. The program requires as inputs the number of variables, the data set, and the level of significance at which outliers are to be identified. It is assumed that the data are from a multivariate normal population and the sample size is at least two greater than the number of variables. Although the technique was used primarily in editing biodata, the method is applicable to any multivariate data encountered in engineering and the physical sciences. An example is presented to illustrate the technique. Author

N71-31398*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GENERALIZED SOFTWARE SYSTEM FOR MULTIPLE SMALL DATA-ACQUISITION SYSTEMS

Norman A. Landis, Jr. Washington Jul. 1971 20 p refs

(NASA-TM-X-2331; E-6328) Avail: NTIS CSCL 09B

A software system was developed for small data-acquisition systems used in life-testing applications. The data acquisition systems provide the functions of data acquisition, limit checking, limited experiment control, data recording, and data processing. Most of the operational characteristics of the system are controlled by parameter tables. These tables are easily modified in mnemonic form, by research personnel, via the console teletypewriter. The data analysis calculations are written in an on-line conversational interpretive language. Modifications to the processing codes can be made from the console teletype in the source language without reassembly. The result is a generalized software system which is very flexible and easily modified for new or changed applications. Author

N71-31412# Dartmouth Coll., Hanover, N.H. Dept. of Mathematics.

CASE STUDY IN INTERACTIVE COMPUTER GRAPHICS. COMPUTER-AIDED DESIGN OF LOGICAL CIRCUITS. VOLUME 2/APPENDICES

Jean Gotman Feb. 1971 214 p refs

(Contract F44620-68-C-0015)

(AD-722095; AFOSR-71-0928TR) Avail: NTIS CSCL 9/2

A software package is written for a computer-aided design of logical circuits. Using a graphic terminal and a light-pen, the user will build a logical circuit choosing the components from a set offered to him, and connecting them to each other. During this highly interactive process, all the users mistakes may be corrected. The software system organizes the data from the picture in a data structure specifically designed to allow easy manipulation of the picture on one hand, and for a subsequent simulation of the circuit on the other hand. The first part (creation of the circuit) makes use of a PDP-9 computer with 8k of core, a GRAPHIC-2 terminal and a 250 K disk. The second part (simulation) is done by the LOGICS program on a GE-635 Time-Sharing to which the PDP-9 is connected by a high-speed line. The user has a choice between 10 to 12 different components. Practically, the circuit may have approximately 30 to 40 components. Author (GRA)

N71-31413# General Research Corp., Santa Barbara, Calif.
NOTE ON VULNERABILITY OF COMPUTERS TO LIGHTNING
R. D. Hill Apr. 1971 18 p refs
(Contract N00014-67-C-0272)
(AD-722675; IMR-1496) Avail: NTIS CSCL 9/2

Estimates of component damage and/or expected numbers of malfunctions in computers due to lightning have been obtained on the basis of data on the frequency of thunderstorm days and preliminary information on the vulnerability of unprotected computers to like-lightning simulated disturbances. It is roughly estimated that as many as half-a-dozen malfunctions per year might be expected in Florida and as few as one malfunction in two years in New England. The number of cases of actual component damage due to lightning might be expected to be as much as three orders of magnitude less than the numbers of malfunctions. Author (GRA)

N71-31436# Naval Postgraduate School, Monterey, Calif.
TIME SERIES ANALYSIS OF ANALOG DATA BY ANALOG-TO-DIGITAL AND DIGITAL DATA PROCESSING METHODS AT THE NAVAL POSTGRADUATE SCHOOL
Robert Drake Jones (M.S. Thesis) Mar. 1971 86 p refs
(AD-722592) Avail: NTIS CSCL 9/2

Time series data consisting of temperature and velocity fluctuations recorded two to four meters above a tidal mud flat were processed to produce power spectra. The analog data were first processed through an Analog-to-Digital computer consisting of a Hybrid Computer System (XDS 9300/Ci 5000). The resulting tapes, in octal representation, were converted to hexadecimal representation for further processing on a 768k byte storage digital computer (IBM 360/67). A series of three digital programs were used to compute and plot Fourier coefficients in spectral form. Digital data processing procedures using magnetic tape on the two computer systems is explained in detail and specific examples of programs and control card decks are given. Author (GRA)

N71-31599# California Univ., Los Angeles. School of Engineering and Applied Science.
WALSH-HADAMARD TRANSFORMATIONS IN IMAGE PROCESSING
Nikitas A. Alexandridis Mar. 1971 127 p refs
(Grant AF-AFOSR-1915-70)
(AD-723662; UCLA-ENG-7108; AFOSR-71-1362TR) Avail: NTIS CSCL 9/2

A technique is presented for obtaining the Walsh-Hadamard (W-H) transform of a picture in real-time by operating separately on each picture line. Overlap of scanning and computations, results in savings of the total time required to transform a picture. For digital computer processing core storage requirements are reduced. The technique leads to the hardware implementation of a machine capable of performing real-time parallel W-H transformation. The axis-symmetry parameter of the Walsh functions is defined and the axis-symmetry number and the period of a Walsh function are derived from its sequency number. Analysis of Walsh spectra establishes the relations between image samples and Walsh spectrum coefficients. Walsh functions are used in designing a feature extractor. The axis-symmetry histogram is obtained from the Walsh spectrum of a pattern by adding the squares of the spectrum coefficients that correspond to a given axis-symmetry number tau and plotting these against tau. Axis-symmetry histograms result in great dimensionality in the feature space. Author (GRA)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N71-30532# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
EFFICIENCY OF WEAK LIGHT PULSE DETECTION AND THE AMPLITUDE DISTRIBUTION FOR PHOTOTUBES K14-FQS-50, 56UVP AND XP-1023
S. P. Denisov, I. I. Karpov, V. I. Rykalin et al 1970 20 p refs In RUSSIAN
(IFVE-SEF-70-11) Avail: AEC Depository Libraries

The dependence of the detection efficiency of light pulses, which are weak in intensity and amplitude distribution, upon the power supply for K14-FQS-50, 56UVP and XP-1023 phototubes is studied. Recommendations for choosing the voltage divider that would provide the maximum detection efficiency are given. It is shown, that without a detailed study of the efficiency dependence upon the voltage at the photomultiplier electrodes, it is possible to choose such a divider with the help of a scope. The noise amplitude spectra have been measured. Author (NSA)

N71-30587# Norges Tekniske Hoegskole, Trondheim. Akustisk Lab.
DESCRIPTION OF STEREO MIXER (SM1) WITH TECHNICAL SPECIFICATIONS AND DATA [BESKRIVELSE AV STEREOMIKSER SM1 MED TEKNISKE SPESIFIKASJONER OG MAELEDATA]
Jan Paus Dec. 1969 17 p In NORWEGIAN
(ILEA-292) Avail: NTIS

During the development and construction of the stereo mixer (amplifier) SM1 discrete components and integrated circuits have systematically been investigated and compared with each other. As a result some integrated circuits have been included in the final version of the prototype as amplifying elements in the filter amplifiers, mixing amplifiers, tone control, monitor amplifiers, and in the control circuits for the power supplies. Apart from the latter, all these circuits are open loop amplifying. Furthermore, a discrete transistor has been used only in the main amplifier. ESRO

N71-30643# Danish Research Centre for Applied Electronics, Copenhagen.
POLYSTYRENE CAPACITORS: QUALITY COMPARISON OF 17 DIFFERENT DESIGNS AND TYPES [POLYSTRENKONDENSATORER: KVALITETSSAMMENLIGNENDE UNDERSOEGELSE AF 17 FABRIKATER OG TYPER]
A. Bjerre Nov. 1970 22 p In DANISH; ENGLISH summary
(ECR-18) Avail: NTIS

None of the 850 capacitors tested have shown catastrophic failure. Measurements of the third harmonic show some difference between the various makes with the same U sub nom. During the tests the change of capacity Delta C for almost all makes is within + or − 0.5%. However, during the damp heat test the changes are greater. The temperature coefficients for the various makes are quite different, the highest about 0.02% per deg C. The loss factor of the capacitors only changes a little during the tests, mostly during the damp heat test. Similar results were obtained as to the insulation resistance in the capacitors, which during the damp heat test dropped to about 10 to the 9th power Omega for some makes. Author (ESRO)

N71-30650*# Bell Bros. Research Corp., Boulder, Colo. Reliability Parts Engineering Section.
ANALYSIS OF ELECTRICAL PARTS SCREENING TEST DATA Final Report, 1968–1970
May 1971 121 p refs
(Contract NAS8-26874)
(NASA-CR-119801) Avail: NTIS CSCL 09A

Acceptance and screening test data, test cost per rejection, and part failure history are summarized on a variety of electronic parts purchased and tested. The parts were purchased for many

programs to various standards and requirements but were tested and screened to similar requirements. Recommendations for more effective part screening tests are made and a discussion of general part program problems is included. The data and information presented can be helpful in determining requirements for part procurement and testing or in defining detailed screening test programs that are quality and cost effective. Author

N71-31066# Council for Scientific and Industrial Research, Pretoria (South Africa).
STABILISED POWER PACK WITH ACCURATE REGULATION [FUENTE DE ALIMENTACION ESTABILIZADA REGULABLE DE PRECISION]
R. Chao 1970 26 p Transl. into ENGLISH from Electron. Fis. Aplic. (Spain), v. 9, no. 36, 1966 p 439–458
Avail: NTIS

An accurate power supply for laboratory use with an output which can be continuously varied between 0 and 400 volts is described. The output voltage is very stable and remains constant with an error of + or − 0.4 volts throughout the range, always preserving the ripple at less than 1 m V. The output current can vary between 0 and 600 mA, having an inbuilt automatic protection against overloads and in addition, fuses against possible short circuits. Besides this, there are various auxiliary AC and DC voltages. All the active elements are solid state, the number being kept to the minimum possible in order to simplify the circuits and for greater reliability. Author

N71-31125*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VACUUM INSULATION FOR ELECTROMAGNETIC COMPONENTS Patent Application
Channing C. Conger, inventor (to NASA) 8 p Filed 28 Jan. 1971
(NASA-Case-LEW-10330-1; US-Patent-Appl-SN-110402) Avail: NTIS CSCL 09A

A device is described that utilizes vacuum insulation for electromagnetic devices that have magnetic cores with windings. It has an open construction and relies on the dielectric strength of space vacuum for insulation. The insulating materials have low initial volatile contents and rapidly release volatile matter under high vacuum. F.O.S.

N71-31170# Danish Research Centre for Applied Electronics, Copenhagen.
ALUMINUM ELECTROLYTE CONDENSER. QUALITY COMPARISON OF 11 DIFFERENT DESIGNS OF LOW VOLTAGE CAPACITORS WITH HIGH CAPACITY. [AL-ELEKTROLYTKONDENSATORER. KVALITETSSAMMENLIGNENDE PROEVER PAE 11 FABRIKATER LAVVOLT KONDENSATORER MED STORE KAPACITETER]
A. Laursen Sep. 1970 36 p In DANISH Sponsored by Sammenslutningen for Paalideligheds-Og Miljoetek. (SPM)
(ECR-16) Avail: NTIS

The quality of a number of electrolytic capacitors from different manufacturers is compared. The capacitors investigated should be low voltage types with large capacity (filter types) classified as type 2 (general purpose). The temperature range should be from −25 to +85 C. Author (ESRO)

N71-31307*# Kaman Avidyne, Burlington, Mass.
STUDY OF THE CONCEPT OF INERTIALLY AIDED BAROMETRIC ALTIMETRY SYSTEM FOR SUPERSONIC AIRCRAFT
J. Ray Rustenik, John H. Thompson, and Kenneth R. Britting Washington NASA Jun. 1971 136 p refs
(Contract NAS12-2132)
(NASA-CR-1770; TR-65) Avail: NTIS CSCL 09E

Research needs are studied for providing a hybrid inertial barometric altimetry system to meet vertical separation requirements of 1000 and 2000 feet for Mach 3.5 transports cruising in altitude hold at 80,000 feet. The static pressure error of the barometric subsystem must be reduced an order of magnitude from present errors for subsonic jet aircraft systems. An off-the-shelf inertial subsystem having a 3 sigma accuracy of 0.002 g's should be satisfactory, provided the lag of the barometric system is 10 seconds or less. The height deviations from a flight level due to turbulence, atmospheric temperature variations, and variations in isoberic surface height are estimated to be negligible for a hybrid altimeter system. The deviations near the phugoid frequency are essentially eliminated by the system. Flight tests are recommended to verify that all the important factors have been accounted for adequately. Author

N71-31369# Avco Corp., Wilmington, Mass. Systems Div.
SIMPLE ANALYTICAL MODELS FOR CALCULATING BREAKDOWN IN AIR-FILLED TRANSMISSION SYSTEMS
Ronald L. Fante, Jerrold M. Yos, and Joaquin J. Otazo 1 Apr. 1971 24 p refs
(Contract F19628-69-C-0121)
(AD-722719; AVSD-0196-CR-71; AFCRL-71-0206) Avail: NTIS CSCL 9/1

Simple mathematical models are developed to predict the onset of microwave breakdwon in air-filled coaxial transmission lines and rectangular waveguides. Author (GRA)

N71-31372*# Battelle Memorial Inst., Columbus, Ohio. Radiation Effects Information Center.
RADIATION EFFECTS DESIGN HANDBOOK. SECTION 4: TRANSISTORS
J. E. Drennan and D. J. Hamman Washington NASA Aug. 1971 37 p refs
(Contract NASw-1568)
(NASA-CR-1834) Avail: NTIS CSCL 09A

Information relating to steady-state radiation effects on transistors is summarized. The radiations considered include neutrons, protons, electrons, and electromagnetic. The information is useful to the design engineer for estimating the effects of radiation on transistors. Author

N71-31414# Air Force Cambridge Research Labs., Bedford, Mass. Microwave Physics Lab.
SURFACE AND ANOMOLOUS WAVES ON PHASED ARRAYS OF TEM WAVESGUIDES WITH FENCES
Robert J. Mailloux 28 Jan. 1971 47 p refs *Its* Phys. Sci. Res. Papers No. 444
(AD-722683; AFCRL-71-0060) Avail: NTIS CSCL 9/5

The report describes the behavior of an infinite array of parallel plane waveguides in a conducting ground plane with metallic fences perpendicular to the ground plane and spaced halfway between each pair of radiators. The study is mainly concerned with anomolous wave nulls and their relation to endfire surface-wave radiation, and, in addition, some data is presented to demonstrate the scan-matching properties of the fence geometry. An interesting new development in open periodic structure theory is reported and is shown to apply to both surface waves and anomolous waves. Certain restrictions on the phase distributions of the aperture fields and fence currents are revealed and studied in detail. In addition to these basic relationships, a numerical study of the scanning properties of waveguide-fence arrays is presented which has indicated that structures of this type can reduce impedance variation during scan and can be especially useful when it is desirable to scan very near to, or even slightly beyond, the point at which a grating lobe moves into real space. Author (GRA)

N71-31451# Technische Univ., Berlin (West Germany). Fakultaet fuer Elektrotechnik.
THE BEHAVIOR OF PLANE SPACE DISCHARGE DIODE

WITH MAXWELLIAN VELOCITY DISTRIBUTION IN THE ALTERNATING- AND NOISE-REGIMES OF THE PROPAGATION TIME [DAS VERHALTEN DER EBENEN RAUMLADUNGSDIODE MIT MAXWELLSCHER GESCHWINDIGKEITSVERTEILUNG BEI WECHSEL- UND RAUSCHGROESSEN IM LAUFZEITGEBIET]

Helmut K. O. Hubert (Ph.D. Thesis) 1969 91 p refs In GERMAN

Avail: NTIS

A computer program is developed for calculating and solving integral equations of conductance and noise problems in plane diodes with Maxwellian velocity distributions. Lewellyn-Peterson approximative solutions are used in the vicinity of the anode at larger frequencies; conductivity values and steepness curves shift to the Mueller solution at lower frequencies. The transfer electron contribution to the overall noise current at the potential minimum decreases with increased p, whereas the number of recoil electrons increases with increasing values for p and for the normalized position coordinate of the cathode up to optimal negative conductance values. The resulting attenuation error changes only minimal in the studied region. Transl. by G.G.

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N71-30481# Hahn-Meitner-Institut fur Kernforschung, Berlin (West Germany).

MODULAR ELECTRONIC SYSTEM FOR COMPUTER-AIDED NUCLEAR EXPERIMENTS [EIN MODULARES ELEKTRONIK-SYSTEM FUER RECHNERGESTEUERTE NUKLEARE EXPERIMENTE]

H. Becker, H. Klessmann, H. Pangritz, and W. Wawer Dec. 1970 64 p refs In GERMAN

(HMI-B-102) Avail: AEC Depository Libraries

Construction and operation of a modular instrumentation system for computer aided experiments in nuclear physics is described. The organization of data transfers between the devices of the experiment and a computer is independent of the type of computer. The interface to a PDP 9 for program controlled and autonomous data transfers is shown in some detail. Author (NSA)

N71-30525# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

INFLUENCE OF GEOMETRIC DIMENSIONS ON THE FREQUENCY BEHAVIOR OF BIPOLAR TRANSISTORS [INFLUENCE DES DIMENSIONS GEOMETRIQUES SUR LE COMPORTEMENT FREQUENTIEL DES TRANSISTORS BIPOLAIRES]

J. P. Bailbe and A. Munoz 1971 20 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29 - 30 Mar. 1971

(LAAS-Publ-774) Avail: NTIS

The behavior of bipolar transistors have been described by a model called BIRD. From this model the influence of the geometry of the transistor on its characteristics are analyzed. ESRO

N71-30531*# Stanford Research Inst., Menlo Park, Calif.

TACTILE PERCEPTION STUDIES RELATED TO TELEOPERATOR SYSTEMS Final Report, 20 Jun. 1970 - 20 Jun. 1971

J. W. Hill and J. C. Bliss Jun. 1971 45 p refs

(Contract NAS2-5409; SRI Proj. 7948)

(NASA-CR-114346; FR-2) Avail: NTIS CSCL 09C

A computer-assisted teleoperator control system for making comparative performance evaluations is described. A local and remote control station, each with decision-making capability, communicate with each other through a simulated time delay. Supervisory control at three increasingly automatic levels is possible. The highest level of programmed control is facilitated through the ARM language which was developed to permit easily readable program manuscripts to be written and assembled into programs of motions by novice programmers. Experimental results show the advantage of this form of supervisory control with both direct and delayed (3 sec) manipulation tasks. In addition, two systems to measure and reproduce force distributions were designed. One system reproduces contact on the external surfaces of the remote hand using 21 airjet simulators. Another system reproduces the shape of the contact between object and jaws using 288 piezoelectric (bimorph) stimulators. Author

N71-30533# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

COMPACT MODELS OF BIPOLAR TRANSISTORS [MODELES COMPACTS DE TRANSISTORS BIPOLAIRES]

G. Rey and P. Leturcq 1971 17 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29 - 30 Mar. 1971

(LAAS-Publ-772) Avail: NTIS

Two models are presented for interpreting the behavior of transistors. They are both based on the effects of focalization-defocalization on parasitic phenomena, in particular recombination, in the passive zone of the transistor. They can both be processes on computers. Arguments are given to justify the initial assumption. ESRO

N71-30555# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

THERMAL BEHAVIOR OF BIPOLAR TRANSISTORS [COMPORTEMENT THERMIQUE DES TRANSISTORS BIPOLAIRES]

J. P. Daubonne and J. P. Bailbe 1971 25 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29 - 30 Mar. 1971

(LAAS-Publ-773) Avail: NTIS

The variations of thermal origin on the different parameters of a transistor according to the IBIS model are analyzed. Theoretical results are compared with experimental measurements for different components in the temperature range from -70 to +125 C. A good correlation is found. ESRO

N71-30558# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

MOS TRANSISTOR MODELS [LES MODELES DES TRANSISTORS MOS]

H. Martinot 1971 25 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29 - 30 Mar. 1971

(LAAS-Publ-775) Avail: NTIS

Different models for metal oxide semiconductor transistors are analyzed, their limits and validity are discussed. ESRO

N71-30557# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

DETERMINATION OF THE BEHAVIOR OF HIGH FREQUENCY MOS TRANSISTORS [IDENTIFICATION DU COMPORTEMENT DES TRANSISTORS MOS EN HAUTES FREQUENCES]

P. Rossel 1971 33 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29 - 30 Mar. 1971

(LAAS-Publ-776) Avail: NTIS

The different factors of the admittance matrice [Yij] of a metal oxide semiconductor transistor are determined, taking into account the substrate effect, the decrease of the mobility of the carriers, and the influence of parasite elements. ESRO

N71-30580# United Kingdom Atomic Energy Authority, Culcheth (England). Reactor Group.

THE USE OF STABILISED STEELS IN THE PFR CIRCUIT

B. Watkins, F. S. Dickinson, F. Turner, and H. Jackson 1970 21 p refs

(TRG-2071) Avail: AEC Depository Libraries

Steels containing carbide stabilizers are necessary in PFR circuits due to decarburization and consequent loss of strength on exposure to sodium. An optimization study of the mechanical properties of stabilized steels led to the selection of an Nb stabilized 2 1/4 Cr 1 Mo steel for the evaporators and a stabilized mild steel for other components. Stabilized steels were used for neutron shield tubes, evaporator boiler tubes and some secondary circuit components. The high integrity requirements of boiler components necessitated particular attention being paid to tube/tube plate welds. Despite the exceptionally high level of quality control applied to these welds both radiographic and ultrasonic techniques were developed to supplement visual inspection and leak detection. The application of these techniques to stabilized steel welds is discussed. The use of stabilized steels for higher temperature applications and alternative tube to tube plate welds are briefly discussed. Author (NSA)

N71-30629# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).

STUDY OF THE ABNORMAL SUBSTRATE CURRENT OF MOS TRANSISTORS [ETUDE DU COURANT ANORMAL DE SUBSTRAT DES TRANSISTORS MOS]

P. Rossel 1971 15 p refs In FRENCH Presented at the Journees d'Etudes DGRST sur les Modeles des Composants Semicond., Toulouse, 29–30 Mar. 1971

(LAAS-Publ-777) Avail: NTIS

A method to compute the value of the abnormal current in the substrate of a metal oxide semiconductors is proposed. It is based on approximate distribution of the electric potential and field in the channel. The influence of polarization voltage, and doping rate of the substrate are analyzed. ESRO

N71-31294# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SYNTHESIS OF MICROPROGRAMS, USING THE BLOCK CIRCUIT METHOD

F. Atstopas et al 10 Feb. 1971 19 p refs Transl. into ENGLISH from the publ. 'Avtomatika i Vychislitelnaya Tekhnika. Trudy XV Ybileynoy Nauchno-Tekhnicheskoy Konferentsii, Posvyashchennoy 25-Letiyu Respubliki' Lithuania, 1968 p 85–94

(AD-722829; FTD-HC-23-778-70) Avail: NTIS CSCL 9/2

An improved Wilks, Stringer, Barty method for the design of digital computer flow charts is described. The method means for description of the structural elements of the functional diagram, functional structure, and dynamics of the computer in the form of rough and exact microprograms. The rough microporgram is an algorithm for completion of instructions using the given functional structure. The exact microprogram is a step by-step description of the algorithm with indication of all the limitations of the microperations execution sequence. Formulas for the trigger input can be derived from the exact microprograms. Brolian formulas can be derived from the description of combination diagrams. Methods are given for the description of structural elements and functional diagrams, and for compiling rough and exact microprograms. Applications of the method is illustrated with the example of the design of a rough printed microprogram from a given rough functional structure, and with the example of compiling an exact microprogram from the designed rough microprogram. Author (GRA)

N71-31373*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

MANNED VEHICLE SYSTEMS ANALYSIS BY MEANS OF MODERN CONTROL THEORY

David L. Kleinman and Sheldon Baron Washington NASA Jun. 1971 194 p refs

(Contract NAS12-104)

(NASA-CR-1753) Avail: NTIS CSCL 09C

A modern control and estimation theory is used to provide a framework for the analysis of manned-vehicle systems. By assuming that the human behaves optimally in some sense, subject to his inherent psychophysical limitations, a quantitative model is developed for the response characteristics of the human operator. The resultant model can be used to predict task performance, scanning behavior, and frequency domain characteristics. The model is described in detail and is used to predict experimentally measured quantities in both single and multiaxis compensatory tracking tasks. Remarkable agreement between measured and predicted quantities is obtained, demonstrating the value and potential of the optimization approach to manned-vehicle systems analysis. Author

N71-31417# Joint Publications Research Service, Washington, D.C.

CERTAIN METHODS OF DEVELOPMENT OF DIGITAL CYBERNETICS SYSTEMS

A. P. Vishnevskiy 23 Jul. 1971 20 p refs Transl. into ENGLISH from Kibernetika (Kiev), no. 1, 1971 p 68–78

(JPRS-53669) Avail: NTIS

New principles of data processing in biological systems and the application program variable logic for calculation are described for use in the construction of polylogical systems with many outputs. Use of these principles would make it possible in some cases to simplify an instrument or system, and in other cases to increase the speed of operation. Author

N71-31446# Technische Univ., Berlin (West Germany). Fakultaet fuer Elektrotechnik.

SYNTHESIS AND ANALYSIS OF DIGITAL NETWORKS FOR CONSTRUCTION OF ALGORITHMS [SYNTHESE UND ANALYSE DIGITALER NETZWERKE ZUR DARSTELLUNG VON ALGORITHMEN]

Hans Christian Liebig (Ph.D. Thesis) 27 Feb. 1969 125 p refs In GERMAN

Avail: NTIS

A formalism is developed that describes the relationship between algorithm and logic for synthesis and analysis of iterative sequential networks by Boolean vector recursion. A matrix algebra is formulated that represents the transfer diagram and describes precisely the algorithmic conditions. This connecting matrix is applied in sequential network, parallel network, and series parallel network syntheses. Multiplication of different connecting matrices provides an analysis of combined sequential machine-iterative network behavior with changeable algorithms. Transl. by G.G.

N71-31479# Purdue Univ., Lafayette, Ind.

ABSTRACTS OF Ph.D. DISSERTATIONS WRITTEN IN THE SCHOOL OF ELECTRICAL ENGINEERING IN 1970

Dec. 1970 74 p

(TR-EE-70-45) Avail: NTIS

Abstracts of Ph.D. dissertations are presented on electronic equipment, game theory, electromagnetic properties, control theory, adaptive systems, and related topics. Abstracts on data compression and error analysis are included. E.H.W.

N71-31522# Technische Hochschule Carolo Wilhelmina, Brunswick (West Germany). Fakultaet fuer Maschinenbau und Elektrotechnik.

HYSTERESIS PHENOMENA IN FREQUENCY MULTIPLIERS WITH SEMICONDUCTOR DIODES

[HYSTERESEERSCHEINUNGEN BEI FREQUENZVERVIELFACHERN MIT HALBEITERDIODE]
Klaus Schuenemann (Ph.D. Thesis) 1970 156 p refs In GERMAN
Avail: NTIS

Recombination and hysteresis losses in frequency multipliers are studied. A charge directed diode model is formulated and used to calculate the relationship between drift field and drift time in the loss mechanism. It is found that hysteresis losses affect multiplication efficiency at high frequencies and that recombination losses reduce low frequency propagation. Transl. by G.G.

N71-31555# Joint Publications Research Service, Washington, D.C.
TRENDS IN MICROELECTRONICS
B. S. Danilin et al 22 Jul. 1971 18 p refs Transl. into ENGLISH from Radiotekhn. (Moscow), v. 26, no. 5, 1971 p 3-11
(JPRS-53659) Avail: NTIS

The integration of semiconductor mass production and film coating techniques for producing integrated circuits is discussed. Metal oxide semiconductor transistor, silkscreen, and vacuum plating techniques for manufacturing thick and thin film hybrid circuits are included. Schematic engineering aspects of logic circuits for use in computers are cited including utilization of bipolar transistors with diode-transistor, transistor-transistor, and resistor-transistor logics. The development and use of large integrated circuits and superhigh frequency integrated circuits are mentioned. A summary is given of integrated circuit uses and prospective uses in computer technology. J.M.

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N71-30482# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
NUMERICAL INVESTIGATION OF A REDUCED FORM STRUCTURE (REENTRANT CAVITY) FOR SUPERCONDUCTING PROTON LINEAR ACCELERATOR IN THE ENERGY RANTE 1- TO 60-MeV [NUMERISCHE UNTERSUCHUNG EINER FORMREDUZIERTEN STRUKTUR (REENTRANT CAVITY) FUER SUPRALEITENDE PROTONEN-LINEARBESCHLEUNIGER IM ENERGIEBEREICH VON 1 - 60 MEV]
H. Hirschmann Apr. 1970 43 p refs In GERMAN; ENGLISH summary
(NP-18724) Avail: AEC Depository Libraries

Superconducting RF-structures in accelerators should be of small size and simple shape in order to reduce losses by heat radiation and to provide high mechanical stability. Thus iris-type structures seem attractive even when applied to non-relativistic particles. A 600 Mc reentrant cavity structure for low energy protons is calculated under a systematical variation of the structural dimensions. It is shown that the outermost diameter may be chosen very small, if the cavities are tuned by drift tubes of suitable thickness. Optimal sets of structural parameters are drawn from the calculations of shunt impedance and the transit time factor. The RF-losses are estimated under reasonable assumptions about the improvement factor and the strength of the average electric field. It is seen that the superconducting structure is appropriate to accelerate protons with an energy above 2 MeV. Author (NSA)

N71-30483# Max-Planck-Institut fur Physik und Astrophysik, Munich (West Germany).
DEVELOPMENT OF A STAR ATMOSPHERE SIMULATOR [ENTWICKLUNG EINES STERNATMOSPHAEREN-SIMULATORS]
J. V. Specht Apr. 1970 8 p In GERMAN
(MPI-PAE/Extraterr-38) Avail: AEC Depository Libraries

A star atmosphere simulator, based on the principle of heating a hydrogen plasma by a system of arcs at its boundary, was developed. The principle of the simulator is discussed in some detail. The electrodes and the arc system are described. The series resistance of the electrodes was determined. Side-on and end-on observations of the plasma are described. Experiments planned with the simulator are indicated. NSA

N71-30490# Joint Inst. for Nuclear Research, Dubna (USSR).
HIGH CURRENT INDUCTION LINEAR ACCELERATOR OF THE NANOSECOND RANGE
V. D. Gitt, A. D. Kovalenko, P. I. Ryl'tsev, and V. P. Sarantsev 1971 9 p refs In RUSSIAN
(JINR-P9-5601) Avail: AEC Depository Libraries

The experimental data on constructing the high-current induction linear accelerator of the nonosecond range, meant to be used as injector in the collective ion accelerator, are presented. The problems considered are connected with the formation of powerful current pulses and voltage with the creation of the accelerating system on ferrite rings, as well as with the focusing and transportation of the electron beam. Author (NSA)

N71-30658# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.
SOME PROPERTIES OF THE ION MOTION IN THE CYCLOTRON U-120
M. Borek and A. Hrda [1970] 42 p refs
(UJV-2498-F) Avail: AEC Depository Libraries

The ion motion in the U-120 cyclotron is considered. A method of solution of the ion motion in the median plane of a cyclotron is described, and some results are discussed which were obtained by employing this method in connection with the relation between the parameters of the cyclotron and the intensity of the internal and external beam as well as by energetic dispersion of the beam on the inlet into the deflector. Further, the vertical motion of ions in the $r > or = 10$ cm region was solved. The influence of the electric and magnetic fields is taken into consideration as well as the influence of the space charge on vertical motion of ions in a linear approximation. Author (NSA)

N71-30694# Gosudarstvennyi Komitet po Ispolzovaniyu Atomonoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
PHASE MOVEMENT OF THE INTENSIVE BEAM IN A PROTON-SYNCHROTRON WITH STRONG FOCUSING
P. T. Pashkov and S. A. Sukeilo 1970 13 p refs In RUSSIAN
(IFVE-SKU-70-15) Avail: AEC Depository Libraries

The influence of a space charge on the beam phase movement in the strong-focussing proton synchrotron was studied. The solution of the phase equation taking into account the influence of the electrical self field of the bunches in case of nonlinear synchrotron oscillations was obtained. The numerical calculations were made for the IHEP Synchrotron in the analog computer MH-7. Author (NSA)

N71-30715# Hahn-Meitner-Institut fur Kernforschung, Berlin (West Germany).
CYCLOTRON COMBINATION FOR ACCELERATION OF HEAVY IONS [EINE ZYKLOTRON-KOMBINATION ZUR BESCHLEUNIGUNG SCHWERER IONEN]
Jan. 1971 27 p refs In GERMAN
(HMI-B-103) Avail: AEC Depository Libraries

A proposal was made to equip the Hahn-Meitner Institut with a heavy ion accelerator which would accelerate ions up to a mass of 40 to 280 MeV or 7 MeV/nucleon. Other characteristics of the accelerator would be continuous variability of the energy up to 20% of the maximum energy, good energy precision, and very flexible pulse range from the nanosecond to the millisecond range. The installation would consist of two isochroncyclotrons operating in series, which could be used independently of each other. The investment costs of the total project would be about 36 million DM, of which approximately a third would be attributed to the accelerator, the new construction, and the experimental devices. Author (NSA)

N71-30741*# Tennessee Technological Univ., Cookeville.
AN OPTIMAL CONTROLLER BASED ON LINEAR APPROXIMATION OF AN ACOUSTICAL TEST FACILITY, PART B Final Report
Dennis L. Luckinbill and Allen R. Atkins, II Jun. 1971 91 p refs
(Contract NAS9-10385)
(NASA-CR-115073) Avail: NTIS CSCL 14B

The possibility of using a more sophisticated control algorithm such as one derived from the deadbeat response criterion, instead of a direct controller is studied. The control algorithm is based on a second order approximation of the entire test facility. The algorithm was tested and proved with the aid of digital simulation runs on an IBM 360-40 computer. The most important area of work is the digital controller study, and the minor area of work is modelling of the major dynamic components of the physical test facility. Author

N71-30743*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
SPACE STATION SIMULATOR ATMOSPHERE ANLYZER Final Report
J. H. Stuart Jun. 1971 131 p
(Contract NAS1-9618)
(NASA-CR-111827; SPO-30007) Avail: NTIS CSCL 14B

The application of a mass spectrometer is described as the primary transducer in a two gas atmosphere sensing system for monitoring and control of the oxygen and nitrogen partial pressures within a manned spacecraft simulator. Author

N71-30766*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATUS OF RESEARCH ON RUNWAY ROUGHNESS
Albert W. Hall, Paul A. Hunter,and Garland J. Morris *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 127-142 refs (See N71-30756 18-02)
Avail: NTIS HC $6.00/MF $0.95 CSCL 01E

Current NASA research on runway surface roughness is described. Typical data available from several programs are illustrated and discussed. The programs emphasize two areas:defining roughness by measuring runway and taxiway profiles and by measuring airplane response to roughness. Author

N71-30767*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RUNWAY SLIPPERINESS
Walter B. Horne *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 143-152 ref (See N71-30756 18-02)
Avail: NTIS HC $6.00/MF $0.95 CSCL 01E

The effects of runway contaminants and pavement surface properties on runway slipperiness are discussed. Results show that contaminants such as water, slush, snow, ice, dust, oil, and rubber deposits on conventional pavement surfaces can produce intolerable levels of runway slipperiness in terms of safe aircraft operation. When wet, conventional surfaces vary considerably in slipperiness due to pavement surface microtexture and macrotexture. A more consistent safe level of slipperiness appears achievable with new surface treatment techniques such as runway grooving and porous asphalt overlays. E.H.W.

N71-30772*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INFLUENCE OF MOTION ON THE EFFECTIVENESS OF FLIGHT SIMULATORS IN TRAINING MANEUVERS
Richard S. Bray, Fred J. Drinkwater, III, and Emmett B. Fry *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 207-220 refs (See N71-30756 18-02)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14B

The use of a new research flight simulator has demonstrated the value of lateral motion cues in the simulation of maneuvers required in the training of air transport pilots. The availability of very extensive lateral motion has provided the opportunity to form a tentative definition of the minimum lateral motion required to produce the desired simulation fidelity. The less extensive vertical motion capabilities of the simulator provided useful cues but did not markedly reduce the long standing problem of accurately simulating the flare and touchdown portion of the landing maneuver. The overall effectiveness of the simulator in takeoff and landing maneuvers involving lateral directional control problems suggests that the scope of simulator training tasks can be expanded beyond those currently performed in flight and simulators. Author

N71-30776*# Virginia Univ., Charlottesville.
SOME ASPECTS OF THE AERODYNAMICS OF STOL PORTS
Hermon M. Parker, Jeffry N. Blanton, and Kalman J. Grunwald (NASA. Langley Res. Center) *In* NASA. Langley Res. Center NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 263-276 (See N71-30756 18-02)
Avail: NTIS HC $6.00/MF $0.95 CSCL 01E

Some aspects of elevated-STOL-port aerodynamics are considered. Two problems of concern are crosswinds and building-induced flow fields. The steady crosswind velocity profile in the landing region, flow separation, vortex shedding, or other unsteady flow phenomena which may contribute significantly to the hazards of landing an STOL craft are discussed. A possible approach to the solution of the crosswind and building-induced-flow-field problems through modifications to the elevated-STOL-port building is presented. Some quantitative measurements of dynamic pressure were made, but most of the observations were qualitative flow visualizations - smoke and tuft. The effect of fence structure and geometry on changes in crosswind velocity profiles was investigated. Author

N71-30778*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF TURBULENCE AND WIND SHEAR MODELS FOR SIMULATOR APPLICATION
Richard L. Kurkowski, George H. Fichtl (NASA. Marshall Space Flight Center), and Joseph Gera (NASA. Langley Res. Center) *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 291-306 refs (See N71-30756 18-02)
Avail: NTIS HC $6.00/MF $0.95 CSCL 14B

Information on continuing studies aimed at producing realistic models of turbulence and wind shears for handling qualities studies is presented. An evaluation of analytical models of turbulence which have non-Gaussian gust distribtuions, a statistical analysis of wind shear, and a brief evaluation of the effects of wind shear on aircraf operations are included. Author

N71-30825*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
INVESTIGATION OF THE FEASIBILITY OF MAKING MODEL ACOUSTIC MEASUREMENTS IN THE NASA AMES 40-BY 80-FOOT WIND TUNNEL

David Alan Bies [1971] 120 p refs
(Contract NAS2-6206)
(NASA-CR-114352) Avail: NTIS CSCL 14B

Sound propagation in a 40-by 80-food wind tunnel has been investigated. The general results appear to be applicable to any closed test section, air return wind tunnel. It is shown that two simultaneous measurements of sound pressure levels upstream and downstream of the test section may be used to estimate forward, backward and total radiated sound power from a model provided that the sound pressure levels due to the model exceed those due to the operation of the tunnel. Measurements at the edge of the test section, in the inlet and diffuser, and in the area of the fans have been investigated. Measurements in the area of the fans give the most accurate estimate of total radiated sound power. Measurements closer to the test section require progressively less model sound power and give better estimates of forward and backward radiation but give less precise estimates of total radiated sound power. Author

N71-30918# Paris Univ., Orsay (France). Laboratoire de l'Accelerateur Lineaire.
[LINEAR ELECTRON ACCELERATOR AND BUBBLE CHAMBER RESEARCH, 1 MAY 1969 – 1 MAY 1970]
Nov. 1970 98 p refs In FRENCH
(LAL-1241) Avail: AEC Depository Libraries

The electron linear accelerator has operated normally and some tests on the utilization of the linac as an injector for a ring were made. Some technical improvements are reported. The performance of the electron-positron collision ring ACO and work done to facilitate its maintenance and improve its performance are reported. Theoretical studies were made on the behavior of the beam in the electron-positron rings and on the beam dynamics. The design considerations made on the 2 × 1.5 GeV collision ring with great luminosity are summarized. The development of techniques and methods of analyzing bubble chamber pictures were continued. In the study of the creation of pairs the experimental points for Be, Al, and Pt are in good agreement with the theoretical curves. NSA

N71-31148# Royal Norwegian Council for Scientific and Industrial Research, Blindern. Space Activity Div.
ANDOYA ROCKET RANGE, NORWAY
2 Apr. 1971 25 p
(SAD-9-T) Avail: NTIS

The Norwegian rocket range on the island of Andoya is described. Apart from this rocket range, the satellite telemetry station in Tromsoe has been used for projects carried out in cooperation with other nations and international organizations. The Kongsfjord satellite telemetry station at Spitzbergen is run by the Royal Norwegian Council for Scientific and Industrial Research (NTNF) on behalf of ESRO. ESRO

N71-31173# European Space Research and Technology Center, Noordwijk (Netherlands).
THE ANTENNA TEST RANGE AT ESTEC [INSTALLATION D'ESSAI D'ANTENNES A L'ESTEC]
E. T. Ford Dec. 1970 72 p refs
(ESRO-TN-97F-ESTEC) Avail: NTIS

A description is given of the facility at present installed at ESTEC for the development and testing of antennas. A procedure is proposed by which people other than the Antenna and Propagation Section of the Telecommunications Division can make use of this facility. A list of equipment available at the test site and at the ESTEC test gear pool is included. The possible expansion of the facility for easier and more accurate use in the future is briefly examined. Author (ESRO)

N71-31182# Sandia Corp., Albuquerque, N.Mex. Hazard Definition and Evaluation Div.
FOLLOW-ON TEST OF PROJECT FIRESCAN AS AN RTG HEAT SOURCE SEARCH AND DETECTION SYSTEM
J. L. Entrekin Feb. 1971 24 p refs Sponsored by AEC
(SC-DR-710095) Avail: NTIS

The Firescan system was retested as an airborne detection system for use in the search, detection, and recovery of earth-impacted radioisotope heat sources. Test data and photographic results are presented. Author (NSA)

N71-31483# Kaiser Engineers, Oakland, Calif.
TRANSIT ACCESS FEASIBILITY STUDY FOR OAKLAND AIRPORT ACCESS TASK FORCE Final Report
15 Oct. 1970 77 p refs Sponsored by Dept. of Transportation
(PB-197837; UMTA-CAL-T9-9-70; Rept-70-54-RE) Avail: NTIS CSCL 13B

To respond to the need to increase speed, reliability and convenience of surface transportation link of air flight trip this study developed plans for improved transit services in the study area, examined the feasibility of those plans, and recommended means of implementing and funding. The effort was to connect the airport to the rapid transit system. The choice of extending BART (the rapid transit system) to the airport or install a separate connector system was considered. The Oakland Airport Connector System was selected as more advantageous because of lower cost and more frequent service. A comparison of the various Oakland Airport Connector Systems found a small vehicle service to be the most attractive as far as service, flexibility, and cost. Author (GRA)

N71-31550# European Organization for Nuclear Research, Geneva (Switzerland).
THE ISR BACKGROUND CONDITIONS FROM MEASUREMENTS AT THE CERN PROTON SYNCHROTRON
V. Agoritsas, M. Bott-Bodenhausen, B. D. Hyams, and K. M. Potter 14 Jan. 1971 42 p refs
(CERN-71-1) Avail: AEC Depository Libraries

The primary source of background radiation at the CERN Intersecting Storage Rings (ISR) will be interactions between the high-intensity stored beam and the residual gas in the vacuum vessel, even at 10 to the minus 10th power torr. Pertinent measurements made at the CERN Proton Synchrotron recently are reviewed. No intolerable background conditions at the ISR are expected. Monitoring of beam – beam interactions at the ISR with simple arrangements of scintillation counters is also discussed. NSA

N71-31551# Stanford Linear Accelerator Center, Calif.
QUANTUM FIELD STATE OF THE SYNCHROTRON RADIATION OF A CLASSICAL ELECTRON IN A STORAGE RING [KVANTOVOE SOSTOYANIE POLYA SINKHROTRONNOGO IZLUCHENIYA KLASSICHESKOGO ELEKTRONA V NAKOPITELE]
N. N. Nsugol'nii et al Dec. 1970 22 p refs Transl. into ENGLISH from Russian Report KHFTI-70-15 Sponsored by AEC
(SLAC-Trans-125) Avail: NTIS

The real multiphonon state of the radiation field, its time dependence, polarization, spectrum, angular distribution, and distribution of the number of photons are calculated and compared with the Schott formula. Information of this kind is of value when synchrotron radiation is used to conduct various types of correlation and interference experiments. NSA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N71-30420# Lyon Univ. (France).
MOBILITY OF THE ADSORBATES AND CONDENSATES, EFFECT ON ISOTOPE SEPARATION BY GASEOUS DIFFUSION [CONTRIBUTION L'ETUDE DE LA MOBILITE DES ADSORBATS ET DES CONDENSATS INFLUENCE SUR LA SEPARATION ISOTOPIQUE PAR DIFFUSION GAZEUSE]
Andre Lallemand (Ph.D. Thesis) 1970 141 p refs In FRENCH
(NP-18567) Avail: AEC Depository Libraries

The flow of adsorbable gases in porous bodies and the isotopic separation of adsorbable gases by gaseous diffusion were studied. In both cases the effects of the adsorbed phase were determined for the entire relative pressure range. A new method to determine the pore radius distribution was developed that enables the flow rate of the gas phase in an adsorbable gas through a porous body to be obtained. Mobility data of the adsorbed phase indicate that the adsorbed molecules move according to the laws of diffusion for a coverage rate <0.7, and that in the multilayer zone the hypothesis of a bidimensional hydrodynamic flow leads to a resistance coefficient definition which varies with the coverage rate. The results of isotopic separation by gaseous diffusion of argon are as follows: (1) for a coverage rate <0.6, the adsorbed phase separation factor is identical with that of the gas phase; (2) in the multilayer zone the adsorbate separation coefficient varies between the value of the gas phase coefficient and zero; (3) in the capillary condensation zone, the separation takes place at the expense of the heaviest element. Author (NSA)

N71-30659# Atomic Energy Commission, Washington, D.C.
CALCULATION OF THE HYDRODYNAMIC CHARACTERISTICS OF CLUSTERS OF RODS
V. I. Subbotin et al [1971] 25 p refs Transl. into ENGLISH from Russian report
(AEC-tr-7184) Avail: NTIS

The methods of calculating the average hydrodynamic values during laminar and isothermal flow of liquids in clusters of rods are examined. The methodology of calculating flow in clusters of rods with large values of S/d is analyzed in detail. The most acceptable methodology in the given case is that based on Rothfuss' perfected method for calculation of flow in annular channels. Formulas are given for calculation of the coefficient of friction in rod clusters. Author (NSA)

N71-30712# Defense Documentation Center, Alexandria, Va.
THREE DIMENSIONAL FLOW, VOLUME 1 Report Bibliography, Jul. 1957 – Nov. 1970
Apr. 1971 309 p refs
(AD-722880; DDC-TAS-70-80-1-Vol-1) Avail: NTIS HC $6.00/MF $0.95 CSCL 20/4

The annotated bibliography consists of references to unclassified and unlimited reports which were processed into the AD data bank from January 1953 through January 1971. Corporate author-monitoring agency, subject, title, personal author, contract, and report number indexes are included. Author (GRA)

N71-30716# Defense Documentation Center, Alexandria, Va.
ONE-DIMENSIONAL FLOW, VOLUME 1 Report Bibliography, Jul. 1950 – Jul. 1970
Mar. 1971 229 p refs
(AD-722850; DDC-TAS-70-74-1-Vol-1) Avail: NTIS CSCL 20/4

The annotated bibliography, Volume I of II volumes, is a selection of references to Unclassified and Unlimited reports processed into the AD Data Bank from January 1953 through January 1971. Corporate author-monitoring agency, subject, title, personal author, contract, and report number indexes are provided. Author (GRA)

N71-30747# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
TURBULENT BOUNDARY LAYER STUDIES IN A HYPERSONIC GUN TUNNEL
G. M. Elfstrom, G. T. Coleman, and J. L. Stollery Apr. 1971 18 p refs
(IC/71/11) Avail: NTIS

A hypersonic gun tunnel has been used to study the growth of a turbulent boundary layer over flat plate and compression corner models. Measurements include pressure and heat transfer rate distributions and pitot pressure profiles across the boundary layer. The results, which extend the existing range of data, are used to test some current theoretical predictions. Author

N71-30749*# Scientific Translation Service, Santa Barbara, Calif.
TRANSONIC FLOW OF GAS IN AXIALLY SYMMETRIC LAVAL NOZZLES WITH STEEP WALLS [O TRANSZVUKOVOM TECHENII GAZA V OXESIMMETRICHNYKH SOPLAKH LAVALYA S KRUTYMI STENKAMI]
V. I. Kireyev et al Washington NASA Jul. 1971 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 6, Nov. – Dec. 1970 p 55 – 58
(Contract NASw-2035)
(NASA-TT-F-13573) Avail: NTIS CSCL 20D

Various numerical methods are proposed for solving both direct and reverse problems involving a calculation of a flow of an ideal gas through a Laval nozzle. An analysis of these methods shows that regardless of the two-dimensionality of the obtained flow fields, the distribution of pressure over the wall and the central streamline differs very little from that obtained by means of the hydraulic theory in which, as we know, the lateral distribution of parameters is neglected. An analysis is given of the numerical results of a calculation of a gas flow in the transitional region of circular Laval nozzles with very steep nozzles, where the parameters of the stream change substantially in the lateral direction, and their values differ strongly from those obtained in the hydraulic approximation. Author

N71-30750*# Scientific Translation Service, Santa Barbara, Calif.
SIMILARITY OF SUPERSONIC SEPARATED FLOWS [PODOBIYE SVERKHZVUKOVYKH SRYVNYKH ZON]
M. G. Morozov Washington NASA Jul. 1971 9 p Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 6, Nov. – Dec. 1970 p 115 – 118
(Contract NASw-2035)
(NASA-TT-F-13577) Avail: NTIS CSCL 20D

An analysis is made of the results of an investigation involving flows past rectangular recesses in plane and axially symmetric bodies immersed in a supersonic air stream. An investigation was made of the distribution of static pressure and adiabatic temperature over recesses with edges located at the same height and at different heights. The results are given of the measurements of the drag of a conically-cylindrical body with an annular gap, depending on the length of the gap and the height of the trailing edge. Author

N71-30801*# Scientific Translation Service, Santa Barbara, Calif.
INVESTIGATION OF A THREE DIMENSIONAL SEPARATED FLOW AROUND SEMICONES PLACED ON A PLANE PLATE [ISSLEDOVANIYE TREKHMERNOGO OTRYVNOBO OBTEKANIYA POLUKONUSOV, USTANOVLENNYKH NA PLOSKOY PLASTINE]
V. S. Avduyevskiy and V. K. Gretsov Washington NASA Jul. 1971 10 p ref Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), no. 6, Nov. – Dec. 1970 p 112 – 115
(Contract NASw-2035)
(NASA-TT-F-13578) Avail: NTIS CSCL 20D

The effect of viscosity on supersonic flow around circular semicones placed on a plane plate is investigated experimentally.

The location of the flow lines and separation lines, depending on the angle between the semicone and the unperturbed flow velocity vector, is determined. It is found that flow in a section normal to the line of separation is two-dimensional. Author

N71-30802# ARO, Inc., Arnold Air Force Station, Tenn.
INFLUENCE OF INITIAL BOUNDARY LAYER ON THE TWO DIMENSIONAL TURBULENT MIXING OF A SINGLE STREAM Technical Report, 1 Jul. 1969 – 30 Jun. 1970
R. C. Bauer and R. J. Matz AEDC Apr. 1971 47 p refs
(Contract F40600-71-C-0002)
(AD-722442; AEDC-TR-71-79) Avail: NTIS CSCL 20/4

An integral method is presented for estimating the influence of an initial boundary layer on the development of a two-dimensional, isobaric, turbulent, free shear layer. The basic equation is derived by applying the principle that, at any streamwise station along the free shear layer, the momentum of the entrained flow equals the total axial turbulent shear force acting along the dividing streamline. This equation is solved using a single parameter family of velocity profiles derived by Korst and Prandtls mixing length concept for turbulent shear stress. The theory involves one empirical constant which was evaluated using Tollmiens experimental data for incompressible, turbulent mixing. The theory is verified by comparing with experimental data for free-stream Mach numbers up to 6.4. Author (GRA)

N71-30938*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STARTING PHENOMENA FOR HYPERSONIC INLETS WITH THICK TURBULENT BOUNDARY LAYERS AT MACH 6
Theodore J. Goldberg and Jerry N. Hefner Washington Aug. 1971 36 p refs
(NASA-TN-D-6280; L-7665) Avail: NTIS CSCL 20D

The effects of cowl length, cowl bluntness, cowl angle of attack, boundary layer thickness, free stream Reynolds number, and wall temperature on the starting phenomena of two-dimensional hypersonic inlets with turbulent intake boundary layers were experimentally investigated at a free stream Mach number of 6. The inlet total-pressure recovery (including both shock and viscous losses) governs starting in contrast to only the normal shock pressure recovery usually considered. The total-pressure recovery required for starting is predicted reasonably well by a one-dimensional analysis. Author

N71-31069 Utah Univ., Salt Lake City.
THE BORN – GREEN – YVON 2 THEORY FOR LIQUIDS
Yong-Teh Lee (Ph.D. Thesis) 1970 103 p
Avail: Univ. Microfilms Order No. 70-14446

The Born – Green – Yvon (BGY) hierarchy is truncated by introducing a superposition approximation to the quadruplet correlation function. The resulting pair of two simultaneous integral equations including the triplet and pair correlation functions is reformulated to give mathematically simpler forms. The BGY2 theory is checked for its internal consistency by using the hard-sphere potential. The following results have been obtained: (1) The BGY2 radial distribution function g(r) differs slightly from the exact g(r) calculated by the Monte Carlo method; the maximum deviations are 0.82% and 1.4%. (2) The quantity PV/(NkT) was calculated from the BGY2 theory. The values 1.186 and 1.779 were obtained, which are very close to the exact values 1.189 and 1.777 obtained from the Monte Carlo calculation. These results indicate that the BGY2 theory compares more favorably with the exact data than any other theories for g(r) and that it satisfactorily describes low and moderately dense fluids. Dissert. Abstr

N71-31072*# Techtran Corp., Glen Burnie, Md.
IONIZATION RELAXATION BEHIND SHOCK WAVES IN NITROGEN AT VELOCITIES OF 17 – 25 KILOMETERS PER SECOND [IONIZATSIONNAYA RELAKSATSIYA ZA UDARNYMI VOLNAMI V AZOTE PRI SKOROSTYAKH 17 – 25 KM/SEC]
M. B. Zheleznyak Washington NASA Jul. 1971 11 p refs Transl. into ENGLISH from Zh. Prikl. Mekhan. i Tekhn. Fiz. (USSR), no. 6, 1970 p 126 – 130
(Contract NASw-2037)
(NASA-TT-F-13592) Avail: NTIS CSCL 20D

Ionization relaxation and recombination of ions, electrons, and molecules of nitrogen are examined and parametrically evaluated. Author

N71-31183# California Univ., Berkeley. Div. of Aeronautical Sciences.
THE EFFECT OF SECOND ORDER ELASTIC TERMS IN SUPERSONIC PANEL FLUTTER OF FINITE CYLINDRICAL SHELLS
James C. S. Meng, Lien S. Yao, and M. Holt Dec. 1970 28 p refs
(Grant AF-AFOSR-0268-67)
(AD-722447; AS-70-9; AFOSR-71-0943TR) Avail: NTIS CSCL 20/4

An analysis for the flutter boundary of a finite isotropic cylindrical shell under no static stress in a supersonic free stream is carried out at Mach numbers from 3-10. The effect of second order terms in the elastic equilibrium equation, which was not considered by Li (1967), is examined in detail. The aerodynamic load is computed following the same approximation used by Li (1967), and the elastic displacement of the shell is resolved into a linear combination of sine functions to satisfy the clamped boundary condition at one end and simply supported conditions at the other end. This homogeneous system is solved by Galerkins method. Then the resultant matrix is transformed into a convenient form, having the same characteristic equation, and expressed in triangular form by means of QR-transformations. The required eigenvalues are the diagonal elements of the transformed matrix. The flutter boundary is defined as the curve where the imaginary part of the eigenvalue becomes negative. It is found that the effect of the second order terms is small. Author (GRA)

N71-31184 Pittsburgh Univ., Pa.
AEROSOL DEPOSITION IN A PIPE WITH TURBULENT AIR FLOW
Thomas Larry Montgomery (Ph.D. Thesis) 1970 207 p
Avail: Univ. Microfilms Order No. 70-17063

The deposition of micron size particles on the wall of a 6 inch pipe in which an aerosol was moving under turbulent flow conditions was experimentally measured. Turbulent flow was completely developed and Reynolds numbers were as high as 367,000. A wind tunnel was constructed to establish completely developed turbulent flow in a 6 inch pipe. Homogeneous, mono-dispersed aerosols at charge equilibrium were produced by a spinning disc aerosol generator. Twenty-six different successful experiments were performed with aerosols ranging in size from 0.44 to 2.16 micrometers in diameter. The following conclusions were made: (1) particle charge can increase aerosol deposition in a pipe; (2) present theories underpredict deposition for completely developed turbulent flow; (3) deposition is strongly dependent on Reynolds number; (4) the deposition velocity is not strongly correlated with relaxation times; and (5) there is a need for more experimental data related to aerosol deposition under conditions of turbulent flow. Dissert. Abstr.

N71-31185*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF INLET GEOMETRY ON FLOW-ANGLE CHARACTERISTICS OF MINIATURE TOTAL-PRESSURE TUBES
Thomas J. Dudzinski and Lloyd N. Krause Washington Jul. 1971 16 p refs
(NASA-TN-D-6406; E-6161) Avail: NTIS CSCL 20D

The effect of flow angle on the indication of miniature (0.02 to 0.32 cm o.d.) total-pressure tubes of simple geometry was expermentally determined for subsonic flow. The effects of flow angle are conveniently expressed in terms of the angle at which the error in indicated total pressure becomes 1 percent of the stream impact pressure. Generally, internally beveled tubes have the greatest angle value (up to 27 deg), while flattened oval tubes have the smallest (down to 12 deg). Effects of variations in Reynolds number on the angle were negligible. However, increasing the intensity of a stream turbulence by 20 percent decreased the angle value by 5 deg. Author

N71-31186 Houston Univ., Tex.
A SIMULATION METHOD FOR PREDICTING MASS TRANSFER IN GAS/LIQUID SLUG FLOW
Richard Emmett Dascher (Ph.D. Thesis) 1969 152 p
Avail: Univ. Microfilms Order No. 70-16544

The work was carried out in 1.5 inch pyrex flow channel using pure carbon dioxide and deionized water. The range of flow rates extended from 16 to 75 lbs/hr for gas and 4500 to 10,000 lbs/hr for the liquid. Liquid concentrations in the channel along with basic flow variables were measured and liquid phase mass transfer coefficients calculated. These were correlated with pressure drop in the channel and the curves closely followed the trends of other cocurrent mass transfer investigations, both in slug and nonslug flow. A slug flow mass transfer model was proposed, based on the theory that mass transfer takes place only in step increments, in the mixing zone of the slugs. A model for predicting mass transfer rates was developed in the form of a computer simulation program,using this theory along with an accurate mathematical description of the hydrodynamics of slug flow. A statistical model was developed to predict the spacing between slugs. Dissert. Abstr.

N71-31197 Illinois Univ., Urbana.
TWO DIMENSIONAL SUPERSONIC ASYMMETRIC FLOW BETWEEN PARALLEL SYMMETRIC BOUNDING WALLS
David Edward Wollersheim (Ph.D. Thesis) 1969 63 p
Avail: Univ. Microfilms Order No. 70-13544

A model to predict the operating conditions of a two-dimensional supersonic asymmetric jet was developed which employs an inviscid flow theory. The Korst base pressure model along with single stream mixing theory was used to modify the uniform flow state. The effects of mass bleed were included and the mixing parameter was modified in its interpretation so that it could be used to help predict the flow characteristics at the exit of the model. The theoretical calculations were all programmed on the IBM 7094 digital computer and an experimental program was initiated. A flow channel was built which had a Mach 1.7 nozzle issuing between parallel walls. The ratio of the total channel area to nozzle area was varied from 4 to 6. Experimental results for area ratios of 4, 5, and 6 are presented along with the results for mass bleed into the base region. Agreement with theoretical prediction is satisfactory. Dissert. Abstr.

N71-31202 Illinois Inst. of Tech., Chicago.
STIMULATED TEMPERATURE AND VELOCITY DISTURBANCES IN A LAMINAR BOUNDARY LAYER
Richard Irwin Loehrke (Ph.D. Thesis) 1970 111 p
Avail: Univ. Microfilms Order No. 70-17253 CSCL 20D

The experimental techniques required to test the Obremski–Morkovin, quasi-steady, theoretical model for the instability of unsteady laminar boundary layers are developed. This model consists of the concept of disturbance wave packets (Tollmien-Schlichting waves) propagating downstream and amplifying or decaying at rates determined by the stability characteristics of the local, instantaneous velocity profiles of the boundary layer. A disturbance generator is described which is capable of seeding two dimensional waves both continuously (in the frequency range of 50 to 200 Hz) and in finite wave packets by the streamwise vibration of a fine, heated wire. The propagation and amplification of velocity wave packets introduced in laminar boundary layers on a flat plate in a low speed wind tunnel are investigated for both steady and periodic freestream flows. The associated thermal wake of the wire is also investigated and shown to decay rapidly. Dissert. Abstr.

N71-31203 University of Southern Calif., Los Angeles.
AN EXPERIMENTAL INVESTIGATION OF THE VISCOUS SUBLAYER REGION IN A TURBULENT BOUNDARY LAYER
Ashok Kumar Gupta (Ph.D. Thesis) 1970 136 p
Avail: Univ. Microfilms Order No. 70-16865

Hot wire measurements in the wall region of turbulent boundary layer at 1900 < or = R theta < or = 8500 showed that the spatially periodic structure could be detected by using a short time, two point spanwise correlation technique on either streamwise or spanwise velocity fluctuations. The values of mean dimensionless spanwise wavelength and the percentage standard deviation about this mean were in good agreement with the values given by Kline, Reynolds, Schraub, and Runstadler. In addition, the two point correlation measurements in the direction normal to the wall indicated a pair of thin counter rotating eddies intermittently appearing in $0 < y^+ < 20$, along with a pair of larger eddies on top. Reynolds stress fluctuations were found to be intermittent all across the turbulent boundary layer with the value of flatness factor in the log region remaining almost constant at about 9.5. The three velocity components of the fluctuation were also intermittent in the region 0 < or = y^+ < or = 7. Dissert. Abstr.

N71-31207*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A TIME-DEPENDENT METHOD FOR CALCULATING SUPERSONIC ANGLE-OF-ATTACK FLOW ABOUT AXISYMMETRIC BLUNT BODIES WITH SHARP SHOULDERS AND SMOOTH NONAXISYMMETRIC BLUNT BODIES
Richard W. Barnwell Washington Aug. 1971 75 p refs
(NASA-TN-D-6283; L-7593) Avail: NTIS CSCL 20D

A time-dependent numerical method for calculating supersonic flow about blunt bodies at large angles of attack is presented. The axisymmetric bodies with sharp shoulders which are treated were constructed with a generator composed of segments of constant curvature. The nonaxisymmetric bodies have continuous slope and curvature. All flow fields are inviscid and adiabatic and have one plane of symmetry. A modification to the method of characteristics is introduced for use at the shock wave. A two-step finite-difference method of second-order accuracy is used at the body surface and in the region between the shock and body. A new finite-difference technique is introduced for use at sharp sonic shoulders. Comparisons of the results of the method with experimental results and the results of other methods are made for the flow of equilibrium air past the Apollo command module at the trim angle of attack and for perfect gas flow past a spherical cap and a spherically blunted cone at angle of attack. Both the cap and the blunted cone were terminated with sharp shoulders. Results are also presented for perfect gas flow past a prolate spheroid with its major axis normal to the flow. Author

N71-31211*# Illinois Univ., Urbana.
A STUDY OF THE LOCAL PRESSURE FIELD IN TURBULENT SHEAR FLOW AND ITS RELATION TO AERODYNAMIC NOISE GENERATION Semiannual Status Report, 1 Aug. 1970–31 Jan. 1971
Barclay G. Jones and Burce W. Spencer 31 Jan. 1971 22 p refs
(Grant NGR-14-005-149)
(NASA-CR-119359; SR-2) Avail: NTIS CSCL 20D

Continuing research is reported in an investigation of the fluctuating static pressure field comprised of a pseudosound pressure field, responsible for generating sound, and true acoustic pressure field. The experimental and analytical findings are concerned

with: (1) Eulerian properties of the mean static pressure field, (2) Lagrangian frame turbulence measurements, and (3) analytical Lagrangian frame turbulent structure. D.L.G.

N71-31302# Case Western Reserve Univ., Cleveland, Ohio. Div. of Fluid Thermal and Aerospace Sciences.
THE EFFECTS OF SUCTION OR INJECTION THROUGH A DISCRETE POINT ON THE FLOW OF A VISCOUS FLUID IN A RIGID TUBE
Sanford Fleeter and Simon Ostrach Nov. 1970 175 p refs
(Grant AF-AFOSR-1485-68)
(AD-722457; FTAS/TR-70-51; AFOSR-70-2715TR) Avail: NTIS CSCL 20/4

This paper deals with the problem of describing the effects associated with small suction or injection through a discrete point on a fully-developed viscous flow in a rigid, circular tube. General differential equations and appropriate boundary conditions describing the flow field are formulated. These general equations are then simplified by means of a nondimensionalization and ordering scheme in a manner consistent with the physical cases are considered: suction or normal injection through a discrete point; and tangential injection through a discrete point. The simplified differential equations are then solved analytically to determine the fluid velocity and pressure distributions. Based upon these solutions, the resulting secondary flows and the attenuation or axial entrance lengths for the two distinct physical cases delineated above are determined. Author (GRA)

N71-31304 Ohio State Univ., Columbus.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE DYNAMICS OF HYDRAULIC CONTROL SYSTEMS CONNECTED BY LONG LINES OR HOSES
George Monroe Swisher (Ph.D. Thesis) 1969 257 p
Avail: Univ. Microfilms Order No. 70-14105 CSCL 20D

Combinations of fluid control and load actuating components in a hydraulic servomechanism were investigated in systems where the components were connected by long metal lines or by flexible rubber (metal-reinforced) hoses. Four typical combinations of fluid control and load actuating components were theoretically analyzed; they are the servovalve and cylinder, servovalve and hydraulic motor, servopump and cylinder, and servopump and hydraulic motor combinations. Theoretical results were obtained by applying a linearized analysis to the four configurations to obtain the set of differential equations describing the dynamic response of the system. A closed-loop electrohydraulic position servo was tested as an experimental system. Dissert. Abstr.

N71-31310*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SHEAR-STRESS, EDDY-VISCOSITY, AND MIXING-LENGTH DISTRIBUTIONS IN HYPERSONIC TURBULENT BOUNDARY LAYERS
Dennis M. Bushnell and Dana J. Morris Washington Aug. 1971 73 p refs
(NASA-TM-X-2310; L-7731) Avail: NTIS CSCL 20D

A method is developed to obtain shear-stress, eddy-viscosity, and mixing-length distributions from hypersonic turbulent boundary-layer profile data by using the assumption of local similarity. Application of the method to published profile data indicates an increase in the maximum value of mixing length and eddy viscosity as the Reynolds number decreases. The level and trend of this low Reynolds number effect agrees with similar results previously obtained at low speeds when wall conditions are used in the correlating parameter. Examination of the wall-damping effect on the mixing length indicates more validity for evaluating the Van Driest damping scale by using wall conditions than by using local sublayer properties and that the impermeable-wall damping constant may be somewhat greater at hypersonic conditions than the usual low-speed value of 26. In several instances, areas of disagreement occurred between the expected and observed behavior of the data, usually concerning the shape of the published velocity profiles. Indications are that the total-temperature data obtained in hypersonic, low Reynolds number, cold-wall boundary layers may not be suitably corrected for conditions near the wall. Author

N71-31377# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
ON THE SUDDEN FREEZE APPROXIMATION IN A VIBRATIONALLY RELAXING GAS
C. J. Shih and P. A. Blythe Feb. 1971 23 p refs
(Contract DAAD05-69-C-0053)
(AD-722779; CAM-110-16; BRL-CR-32) Avail: NTIS CSCL 20/4

It is shown that, in contrast with the weak excitation limit, the sudden freeze approximation does provide a valid description of non-equilibrium nozzle flows in a vibrationally relaxing gas when the relaxation time changes exponentially fast with the translational temperature. The accuracy of the method is improved by the introduction of a modified freezing point. Only flows for which this freezing point lies downstream of the sonic point are considered. The expansion procedures outlined here should be useful in more general problems. Author (GRA)

N71-31393# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
PULSE PROPAGATION IN A NONLINEAR VISCOELASTIC ROD OF FINITE LENGTH
Michael P. Mortell and Brian R. Seymour (New York Univ., N.Y.) Feb. 1971 54 p refs
(Contract DAAD05-69-C-0053)
(AD-722778; CAM-110-15; BRL-CR-33) Avail: NTIS CSCL 20/11

The problem of impact on a nonlinear viscoelastic rod of finite length is considered. It is shown that, in the high frequency or geometrical acoustics limit, the disturbance in the rod may be represented as the superposition of two modulated simple waves travelling in opposite directions which do not intersect in the body of the material. Based on this result the impact and initial-boundary value problems are reduced to finding the solution of a nonlinear difference equation, which is solved exactly. The authors examine the competing effects of amplitude dispersion, which may produce shocks, and dissipation and give conditions under which each dominates. The corresponding results for an inhomogeneous rod are also given. Author (GRA)

N71-31443 University of Southern Calif., Los Angeles.
A STUDY OF THE BEHAVIOR OF THIXOTROPIC FLUIDS
Fan-sheng Tao (Ph.D. Thesis) 1970 166 p
Avail: Univ. Microfilms Order No. 70-16892

The quantitative relationship among the variables shear stress, shear rate, and time is sought. It was assumed that when a thixotropic fluid is subjected to a continuous shearing, the structural breakdown and recovery occur simultaneously. The observed rate of change of the shear stress is the difference between the rate of change due to structural breakdown and the rate of change due to structural recovery. The resulting nonlinear differential equation is solved by further assuming separable functions of shear rate and time. The validity of the several assumptions was verified experimentally by observing the breakdown and recovery properties of three thixotropic fluids in a series of stress-time experiments. Excellent agreement was found on comparing the values predicted, with the experimental data for three thixotropic fluids, namely PVC plastisol, hand and body lotion, and 8% Wyoming aquagel in water. Dissert. Abstr.

N71-31448# Technische Univ., Berlin (West Germany). Fakultaet fuer Maschinenwesen.

THEORETICAL AND EXPERIMENTAL STUDIES ON GAS DIFFUSION IN POROUS AND NON-POROUS SOLIDS [THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNGEN ZUR DIFFUSION VON GASEN IN POROESEN UND NICHTPOROESEN FESTSTOFFEN]

Uwe Peters (Ph.D. Thesis) 1969 159 p refs In GERMAN
Avail: NTIS

The physics of gas sorption on interior surfaces or matrices of solids are considered in order to calculate sorption and separation efficiencies in chemical reactors. Formulated is a porous structural model that incorporates the physical and geometrical properties of the solid material so that the sorption values can be extrapolated and homogenized to give the optimal structure for a desired adsorption process and its effective diffusion coefficient. Example calculations and measurements on bituminous coal are included. Transl. by G.G.

N71-31502# Grumman Aerospace Corp., Bethpage, N.Y. Fluid Dynamics Section.

ELECTRON-ION RECOMBINATION IN A SONIC ORIFACE FLOW

Richard C. Jenkins Jul. 1971 40 p refs Submitted for publication
(RE-412J) Avail: NTIS

A comparison is made of measured and predicted axial variations of flow properties in a freely expanding plasma. Surveys of ion density and electron temperature were obtained in an arc heated argon flow produced by expansion from a 0.635 cm diameter sonic orifice. Measurements were taken from current-voltage characteristics produced by uncooled electrostatic probes that were swept rapidly through the high temperature free jet. The flow field calculations were based on an existing analysis modified to account for thermal nonequilibrium effects. Author

N71-31549# Goodyear Atomic Corp., Piketon, Ohio.

PRECISE COMPUTERIZED IN-LINE COMPRESSIBLE FLOW METERING

G. L. Mustard 11 Feb. 1971 18 p refs Presented at Symp. on Flow: Its Meas. and Control in Sci. and Ind., Pittsburgh, 9–14 May 1971
(Contract AT(33-2)-1)
(GAT-T-1649; Conf-710507-1) Avail: NTIS

An instrument system with associated techniques and procedures is described for direct and precise compressible flow measurement. The system includes a flange tapped concentric orifice instrumented with variable reluctance pressure transducers and thermocouples. Flow measurement repeatability of the order of one part in 500 has been accomplished. Analog signal voltages are scanned, stored, and conditioned to desired engineering units under program control using an on-line mini-computer. Integral calibration facilities and related advantages are discussed. Considerations are given for system dynamic characteristics and for signal integration which reduces inherent pressure noise effects. The determination of the flow element coefficient and salient features of the FORTRAN program described are generally applicable for reducing orifice data directly to mass flow rate. Author (NSA)

N71-31552# California Univ., Livermore. Lawrence Radiation Lab.

X-RAY FLASH STUDIES OF SHOCK WAVES PRODUCED FROM A LIQUID FROZEN BY SHOCK-WAVE PROCESSES.

W. Schaafs et al Dec. 1970 26 p refs Transl. into ENGLISH from Acustica (Berlin), v. 23, 1970 p 99–107 Sponsored by AEC
(UCRL-Trans-10507) Avail: NTIS

A hot gas plasma in a thin dielectric layer of liquid bromobenzene is produced by an electric discharge. This plasma is surrounded by a compression ring of highly compressed matter built up by shock wave processes. The initial high broadening velocity of the compression ring decreases with increasing compression to nearly zero. This phenomenon lasts about 50 microseconds and is explained by the freezing of the original liquid matter. The frozen-in compression ring is however a thermodynamically unstable formation and dissolves by producing a quick melting shock wave. These phenomena were photographed by X-ray flashes and carefully described. Author (NSA)

N71-31586# Ohio State Univ., Columbus. Aeronautical and Astronautical Research Lab.

THE INFLUENCE OF ARTIFICALLY INDUCED TURBULENCE UPON BOUNDARY LAYER TRANSITION IN SUPERSONIC FLOWS Final Technical Report, 1 Dec. 1968 – 15 Jan. 1971

Lawrence E. Olson, Gerald M. Gregorek, and John D. Lee Wright-Patterson AFB, Ohio ARL Jan. 1971 118 p refs
(Contract F33615-69-C-1266)
(AD-723322; ARL-71-0022) Avail: NTIS CSCL 20/4

Acoustic disturbances and high frequency-low amplitude vibrations have been studied as a means to promote early boundary layer transition in a supersonic stream. A theoretical analysis of the stability characteristics of the leading edge of a blunted delta-wing was used to guide the choice of acoustic and vibration frequencies employed in this experimental study. Air driven acoustic generators, located in the stagnation chamber of the wind tunnel, produced a strong resonant tone at 4.6 KHz, with a sound level above 148 dB. Comparison of the Reynolds number dependent flow field on a delta model at angle of attack, using an oil streak technique for flow visualization, provided an index of the effectiveness of the acoustic disturbances. Operation of the tunnel with the tunnel air supplied through the acoustic generators and with the normal air supply indicated the effective Reynolds number of the wind tunnel was increased by a factor near 1.4 by the acoustic generators. Extensive test section total pressure and flow angularity surveys and force and moment measurements on a winged body showed this increase in effective Reynolds number was produced with no degradation of flow quality. Piezoelectric vibration transducers were mounted in the supporting sting of the delta models, vibrating the models at frequencies ranging from 2.9 KHz to 82 KHz with peak-to-peak amplitudes from 49 microinches to 0.0015 inches. These vibrations were not as efficient as surface roughness of a height comparable to the peak-to-peak vibration amplitude in stimulating boundary layer transition. Author (GRA)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N71-30502*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MID-LATITUDE ROCKET OBSERVATIONS OF THE ALTITUDE PROFILE OF THE O2 (a (1 DELTA g))-(X (3 SIGMA g +)) TRANSITION

Jean Welker and W. H. Jones Jan. 1970 10 p refs
(NASA-TM-X-65606; X-615-70-477) Avail: NTIS CSCL 04A

A Nike-Apache was launched on 19 November 1968 carrying an infrared radiometer designed to detect radiation from O2 (a (1 Delta g)) - (X (3 Sigma g plus)) transition centered at 1.268 microns. The radiometer consisted of an uncolled PbS detector with a matching blackened PbS detector which was used as a load resistor in a voltage divider configuration in order to compensate for temperature drifts. Rocket trajectory estimates were made using loss of telemétry signal, Faraday rotation data, trajectory calculations based on procedures developed in the Mercury Program, and ionograms taken prior to launch and immediately after impact. J.A.M.

N71-30590*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE APPLICATION OF COLOR DISPLAY TECHNIQUES FOR THE ANALYSIS OF NIMBUS INFRARED RADIATION DATA

Lewis J. Allison, G. Thomas Cherrix, and Harold Ausfresser (Westinghouse Defense and Space Center, Baltimore, Md.) Aug. 1971 27 p refs Submitted for publication

(NASA-TM-X-65614; X-651-71-275) Avail: NTIS CSCL 04A

A color enhancement system designed for the Application Technology Satellite (ATS) spin scan experiment has been adapted for the analysis of Nimbus infrared radiation measurements. For a given scene recorded on magentic tape by the Nimbus scanning radiometers, a virtually unlimited number of color images can be produced at the ATS operations control center from a color selector paper tape input. Linear image interpolation has produced radiation analyses in which each brightness-color interval has a smooth boundary without any mosaic effects. An annotated latitude-longitude gridding program makes it possible to precisely locate geophysical parameters and permit accurate interpretation of pertinent meteorological, geological, hydrological and oceanographic features. Author

N71-30604# Joint Publications Research Service, Washington, D.C.

OCEANOLOGICAL INVESTIGATIONS IN THE GULF OF MEXICO AND CARIBBEAN SEA

21 Jun. 1971 59 p refs Transl. into ENGLISH from Okeanol. Issled. (Moscow), no. 20, 1970 p 5-45

(JPRS-53412) Avail: NTIS

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1. OCEANOLOGICAL INVESTIGATIONS ON THE 6TH-8TH VOYAGES OF THE RESEARCH VESSEL AKADEMIK KOVALEVSKIY I. M. Belouson p 1-8 refs (See N71-30605 18-13)

2. SOME GEOMORPHOLOGICAL CHARACTERISTICS OF THE SOUTHERN GULF OF MEXICO AND WATERS NEAR CUBA I. M. Belouson p 9-23 refs (See N71-30606 18-13)

3. GEOLOGICAL STUDIES IN THE GULF OF MEXICO AND CARIBBEAN SEA V. I. Melnik p 24-51 refs (See N71-30607 18-13)

4. SOME RESULTS OF HYDROLOGICAL INVESTIGATIONS IN THE CARIBBEAN SEA AND GULF OF MEXICO Y. A. Ivanov p 52-56 refs (See N71-30608 18-13)

N71-30605# Joint Publications Research Service, Washington, D.C.

OCEANOLOGICAL INVESTIGATIONS ON THE 6TH-8TH VOYAGES OF THE RESEARCH VESSEL AKADEMIK KOVALEVSKIY

I. M. Belousov *In its* Oceanological Invest. in the Gulf of Mex. and Caribbean Sea 21 Jun. 1971 p 1-8 refs (See N71-30604 18-13)

Avail: NTIS

Marine geological studies in the Gulf of Mexico and Carbbean Sea are reported as part of a continuing joint Soviet-Cuban oceanological program in this area. Using the research vessel, Akademik Kovalevskiy, the work region was limited to the southern part of the Gulf of Mexico, the continental slope of Cuba's southern coast, the Straits of Florida, the Old Bahama Channel, and the Nicholas and Santaren Channels. Samples of bottom deposits were collected with a straight bottom corer with a 76 mm diameter and an Okean-0.25 dredge. In addition, the use of pilot balloon safety rubber fabric on the lower corer valve enabled collection of bottom samples in sectors with a bedrock base for the first time. Specific data are presented geological-geomorphological characteristics the work region, as well as the redox potential and index of hydrogen ion concentration, color, and calcareous content of the bottom sediments. Based on this information, the mineralogical composition of sediments and the geological characteristics of the region are described. A.C.R.

N71-30606# Joint Publications Research Service, Washington, D.C.

SOME GEOMORPHOLOGICAL CHARACTERISTICS OF THE SOUTHERN GULF OF MEXICO AND WATERS NEAR CUBA

I. M. Belousov *In its* Oceanological Invest. in the Gulf of Mex. and Caribbean Sea 21 Jun. 1971 p 9-23 refs (See N71-30604 18-13)

Avail: NTIS

Geomorphological characteristics of the southern Gulf of Mexico and nearby Cuban waters are described and illustrated, based on a joint Soviet-Cuban expedition using the research vessel, Adademik Kovalevskiy. Detailed information on the bottom relief was sought to aid in hydrological, hydrochemical and biological analyses of these areas. Of particular interest was the regime of strong currents in the Yucatan Channel, Straits of Florida, and the Great Bahama Channel, which exerts a considerable effect on ocean floor structure as indicated by the absence of recent bottom deposits. Measurements were made with an NEL-6 echo sounder and a precise automatic recorder, specifically modified for making the desired depth/determinations. A.C.R.

N71-30607# Joint Publications Research Service, Washington, D.C.

GEOLOGICAL STUDIES IN THE GULF OF MEXICO AND CARIBBEAN SEA

V. I. Melnik *In its* Oceanological Invest. in the Gulf of Mex. and Caribbean Sea 21 Jun. 1971 p 24-51 refs (See N71-30604 18-13)

Avail: NTIS

Three Soviet-Cuban oceanographic expeditions in the Gulf of Mexico and nearby Cuban waters are briefly described. Using the research vessel, Akademik Kovalevskiy, data were gathered at a number of stations on geophysical and biological characteristics of the area to obtain general information concerning this little-studied region and to clarify its biological productivity. In addition, Soviet experience in conducting multi-discipline oceanological investigations were imparted to Cuban specialists during the voyages. In order to determine changes in oceanological characteristics with increasing distance from the Cuban shore, a number of profiles were also run normal to the shoreline in the Old Bahama Channel and in the northern part of the Caribbean Sea. A.C.R.

N71-30608# Joint Publications Research Service, Washington, D.C.

SOME RESULTS HYDROLOGICAL INVESTIGATIONS IN THE CARIBBEAN SEA AND GULF OF MEXICO

Yu. A. Ivanov *In its* Oceanological Invest. in the Gulf of Mex. and Caribbean Sea 21 Jun. 1971 p 52-56 refs (See N71-30604 18-13)

Avail: NTIS

Hydrological investigations in the Caribbean Sea and Gulf of Mexico by a joint Soviet-Cuben team are reported. The principal objective was to study the distribution of hydrological characteristics, primarily in the upper sea layers, to identify those zones whose hydrological conditions favor activation of biological processes. It appears that the essentially nonstationary nature of water circulation in this region is caused by variations in water discharge in the Straits of Florida and Yucatan Channel. A mathematical model of the current system is developed, and the behavior of disturbances in a half-zone with specific transverse boundary oscillations are analytically examined. A.C.R.

N71-30628# Koln Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS ON THE MEASUREMENTS OF TOTAL OZONE

J. J. Becker and A. Ghazi May 1970 29 p refs *Its* Mitt. No. 14
Avail: NTIS

A filter spectrophotometer has been designed for total atmospheric ozone measurements, allowing for spatial and periodic variations of scattered light. The measured intensity distributions are compared to theoretical values of the Rayleigh atmosphere, including ozone absorption. ESRO

N71-30702# Joint Publications Research Service, Washington, D.C.
SEISMIC RESEARCH CONDUCTED BY INSTITUTE OF OCEANOLOGRAPHY
22 Jun. 1971 66 p refs Transl. into ENGLISH from Tr. Inst. Okeanol., Seymicheskiye Issled. Stroyeniya Dna Morey i Okeanov (Moscow), v. 87, 1970 p 5-28, 69-75, and 99-113
(JPRS-53422) Avail: NTIS

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1. SEISMIC RESEARCH METHODS ON OCEANOLOGICAL EXPEDITIONS Y. N. Neprochnov p 1-34 refs (See N71-30703 18-13)

2. DETERMINING EFFECTIVE ABSORPTION COEFFICIENT OF SEISMIC WAVES IN OCEAN SEDIMENTS V. Orlenok p 35-45 refs (See N71-30704 18-13)

3. SEISMIC INVESTIGATIONS BY THE REFLECTED WAVE METHOD IN THE MEDITERRANEAN SEA BETWEEN CRETE AND AFRICA I. N. Yelnikov p 46-65 refs (See N71-30705 18-13)

N71-30703# Joint Publications Research Service, Washington, D.C.
SEISMIC RESEARCH METHODS ON OCEANOLOGICAL EXPEDITIONS
Yu. N. Neprochnov *In its* Seismic Res. Conducted by Inst. of Oceanology 22 Jun. 1971 p 1-34 (See N71-30702 18-13)
Avail: NTIS

Investigations for developing seismic instruments include a seismoacoustic radiobuoy, microprofiling system, improved hydrophones, analyzers, and other instrument components. The design of the hydrophone housing was modified for using PKS-3 piezoceramic elements made from barium titanate. The pressure sensitive elements made is attached to the outside of the housing and is in direct contact with the water. A metal shielding was provided for safeguarding it against mechanical damage. Emphasis is on methods for seismic investigations in the open ocean on large oceanological ships. Author

N71-30704# Joint Publications Research Service, Washington, D.C.
DETERMINING EFFECTIVE ABSORPTION COEFFICIENT OF SEISMIC WAVES IN OCEAN SEDIMENTS
V. Orlenok *In its* Seismic Res. Conducted by Inst. of Oceanology 22 Jun. 1971 p 35-45 refs (See N71-30702 18-13)
Avail: NTIS

The reflected waves method was used in interpreting materials from point seismic sounding. Also, under difficult seismogeological conditions with an almost complete absence of stable reflections from the reference boundaries, using the absorption parameters it was possible to break down the sedimentary stratum and discriminate several layers with different values. The value of effective stratum absorption coefficient is dependent on the thickness of the layer in which this absorption is determined. Author

N71-30705# Joint Publications Research Service, Washington, D.C.
SEISMIC INVESTIGATIONS BY THE REFLECTED WAVE METHOD IN THE MEDITERRANEAN SEA BETWEEN CRETE AND AFRICA
I. N. Yelnikov *In its* Seismic Res. Conducted by Inst. of Oceanography 22 Jun. 1971 p 46-65 refs (See N71-30702 18-13)
Avail: NTIS

Based on seismic investigations, and using the reflected waves method, it was concluded that the sedimentary stratum of the Mediterranean Sea consists of two layers. The first layer consists of unconsolidated deposits, the second layer consists of compacted sediments. The bottom of the second layer can be detected at individual points and its maximum thickness is 2 to 3 km. Point seismic soundings were made at 26 stations. Author

N71-30742*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
RADIATION MEASUREMENTS FROM POLAR AND GEOSYNCHRONOUS SATELLITES Semiannual Report, 1 Oct. 1970-31 Mar. 1971
Thomas H. Vonder Haar May 1971 19 p refs
(Grant NGR-06-002-102)
(NASA-CR-119240; SAR-1) Avail: NTIS CSCL 04A

Diagnostic studies using radiation measurements from the near-earth satellites are applied to problems of atmospheric energetics and circulation. Specifically, measurements from Explorer 7 (1959) thru Nimbus 3 (1970) are used to examine the planetary scale, atmosphere, and oceanic cause/response to observed interannual variation of the equator-to-pole gradients of net radiation. In addition, the separate synoptic scale energetics of the atmosphere (apart from the ocean) are investigated by using independent measurements at the top of the atmosphere (from satellites) and at the air/ground interface. Author

N71-30791# Joint Publications Research Service, Washington, D.C.
OCEANOGRAPHY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 254 15 Jun. 1971 p 16-27 (See N71-30788 18-30)
Avail: NTIS

Soviet news releases on the marine forecasting service, symposium on turbulent diffusion of impurities in the sea, and the return of the search ship, Dimitriy Mendeleyev, from an Atlantic and Pacific expedition are presented. Abstracts on various oceanographic liaterature are given, including foraminiferal toxocaenoses off South American coast, diurnal migrations and feeding rhythm of Euphausiids, and geomorphology of floor of the southeastern Atlantic Ocean. J.A.M.

N71-30792# Joint Publications Research Service, Washington, D.C.
TERRESTRIAL GEOPHYSICS
In its Soviet Bloc Res. in Geophysic, Astronomy, and Space, No. 254 15 Jun. 1971 p 28-37 refs (See N71-30788 18-30)
Avail: NTIS

Soviet news releases are presented on underground tremors recorded in southern Kazakhstan, gamma-gamma densitometer, earthquakes in Yakutsk and Magadan, and a filter for discriminating seismic signals. Abstracts on various geophysical literature are cited, including deep seismic sounding in Queen Maud Land, drift of the south magnetic pole, and high altitude distribution of geomagnetic pulsations. J.A.M.

N71-30793# Joint Publications Research Service, Washington, D.C.
UPPER ATMOSPHERE AND SPACE RESEARCH
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 254 15 Jun. 1971 p 38-52 (See N71-30788 18-30)
Avail: NTIS

Soviet news releases are presented on the Soyuz 10 landing

and flight, six months of Lunokhod operation, and future plans for the Soviet space program. The launchings of Cosmos 419, 420, and 421 and Mars 2 are announced. Satellite-borne infrared instrument for meteorological use is briefly described. Abstracts of various atmospheric and aerospace literature are given, including seasonal variations in radio wave propagation at Mimyy, observation of mesospheric clouds from space, and registry of velocity of meteor trail drift. J.A.M.

N71-30798# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
CAPILLARY WAVE PROJECT Final Report
Willard J. Pierson, Jr. 1970 5 p
(Contract Nonr-285(26))
(AD-722617) Avail: NTIS CSCL 8/3

The Capillary Wave project was started on April 1, 1956. An instrument carriage, a wave probe array, and wind sending instruments were built on the project. The calibration of the wave probe caused considerable difficulty and further work on this will be described in a future report. After the calibration was decided upon, one channel of each of the 146 records obtained under different conditions of fetch, wind speed, and air water temperature difference was digitized and spectrally analyzed. (GRA)

N71-30799# Stanford Univ., Calif. Dept. of Geophysics.
SEISMOLOGICAL ANALYSES OF VELA ARRAY DATA Final Report, 1 Feb. 1966 – 31 Jul. 1970
Robert L. Kovach 30 Aug. 1970 208 p refs
(Contract AF 49(638)-1687; ARPA Order 292-72)
(AD-722444; AFOSR-70-2934TR) Avail: NTIS CSCL 8/11

The research utilized seismic data recorded by VELA arrays, such as LASA and those formed by individual LRSM stations to (1) investigate the velocity structure of the mantle and core; (2) examine the attenuation charactersitics of seismic waves; and (3) study the propagation of seismic waves across large arrays. Author (GRA)

N71-30841# Royal Swedish Academy of Engineering Sciences, Stockholm.
OREGEOLOGY IN THE FUTURE [MALMGEOLOGIEN INFOER FRAMTIDEN]
Arne S. Lundberg *In its* Articles and Speeches at the Anniv. of IVA, 1919–1969 1969 p 214–221 In SWEDISH (See N71-30839 18-34)
Avail: NTIS; Esselte AB, Stockholm: 18 SKR

Ore prospection from satellites is one of the fascinating possibilities offered by the space age, but prospection of the so far known earth resources demands a geological basic research, called by the author "oregeology. This demands new initiative for it means building a bridge over the gap between basic sciences and the economical goals. ESRO

N71-30849*# Exotech, Inc., Washington, D.C.
THE EARTH'S IONOSPHERE: SPACE DESIGN CRITERIA (ENVIRONMENT)
R. G. Lyle and P. D. Stabekis NASA Mar. 1971 49 p refs Sponsored by NASA
(NASA-SP-8049) Avail: NTIS CSCL 04A

The characteristics of the earth's ionosphere which must be taken into account in space vehicle design are detailed. They include electron density and temperature, the neutral component, ionic composition, and plasma temperature. In addition, derived functions are given which are useful for analyzing the interaction of the spacecraft and ionispheric medium. Author

N71-30980# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORIES, PACIFIC OCEANOGRAPHIC LABORATORIES: COLLECTED REPRINTS, VOLUME 1, 1969
Sep. 1970 616 p refs
Avail: SOD $4.25

Papers are presented on marine geology, geophysics, and meteorology. For individual titles, see N71-30981 through N71-31029.

N71-30981# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
DOWN INTO THE SEA IN SHIPS
Robert S. Dietz and Robert F. Dill (Naval Undersea Warfare Center, San Diego, Calif.) *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 8 p Repr. from Sea Frontiers, v. 15, no. 1 p 2–9 (See N71-30980 18-13)
Avail: SOD $4.25

The configuration of the deep submergence vehicle, Deepstar and operations of depths of 3,000 feet in the Gulf of California are reported. The configuration of the ocean bottom, geological formations, and examples of marine biology at these depths are presented in photographs. P.N.F.

N71-30982# Coast and Geodetic Survey, Rockville, Md.
PRECISE ECHO SOUNDING IN DEEP WATER
George A. Maul *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p refs (See N71-30980 18-13)
(ESSA-TR-C/GS-37) Avail: SOD $4.25

The advent of narrow-beam stabilized echo sounders and shipboard digital computers is revolutionizing bathymetry measurements in the deep ocean. New and more precise procedures for obtaining and correcting depth measurements are described, and the application of these methods is presented. Author

N71-30983# Committee on Merchant Marine and Fisheries (U. S. House).
COASTAL ZONE MANAGEMENT CONFERENCE From Subcommittee on Oceanography
Harris B. Stewart, Jr. (ESSA, Miami, Fla.) *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p Hearings Before Comm. on Merchant Marine and Fisheries, 91st Congr., 1st Session, 28–29 Oct. 1969 *Its* Serial No. 91–14 (See N71-30980 18-13)
Avail: SOD $4.25

The effects of water pollution on the coastal ecology are discussed. Research and development projects for eliminating adverse effects of pollution are examined. The interactions of man with the coastal environment are described. P.N.F.

N71-30984# Committee on Merchant Marine and Fisheries (U. S. House).
BISCAYNE BAY AS A NATURAL RESOURCE (AN ADDRESS BEFORE THE ZOOLOGICAL SOCIETY OF FLORIDA) From Subcommittee on Oceanography
Harris B. Stewart, Jr. (ESSA, Miami, Fla.) *In* ESSA Atlantic Oceanog. and Meteorol. Lab., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 5 p Hearings before Comm. on Merchant Marine and Fisheries, 91st Congr., 1st Session, 28-29 Oct. 1969 *Its* Serial No. 91-14 (See N71-30980 18-13)
Avail: SOD $4.25

The value of Biscayne Bay, Florida as a natural resource is discussed. The effects of water pollution on the ecology of the bay are described and methods to eliminate pollution sources are recommended. P.N.F.

N71-30985# Environmental Science Services Administration, Miami, Fla.
OCEANOGRAPHY AND THE US MERCHANT MARINE

Harris B. Stewart, Jr. *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 10 p Repr. from US Naval Inst. Proc., v. 95, no. 10/800, 1969 p 68–77 (See N71-30980 18-13)
Copyright. Avail: SOD $4.25

Oceanography contributions to the alleviation of many of shipping problems through providing the knowledge of the sea that will permit its more efficient and hence less costly use for transportation are discussed. Cost is the major factor that has resulted in the present difficulties in which the ocean transportation industry in this country now finds itself. Many of these costs can be reduced by the use of the knowledge that will become available as we learn more about the sea in general and more about those specific aspects of it which have a direct bearing on its use as the major intercontinental highway. Author

N71-30986# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
INTERPRETATION OF THE MAGNETIC ANOMALIES OFF CENTRAL CALIFORNIA
B. G. Bassinger, O. E. De Wald, and G. Peter *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 4 p refs Repr. from J. Geophys. Res., v. 74, no. 6, 15 Mar. 1969 p 1484–1487 (See N71-30980 18-13)
Copyright. Avail: SOD $4.25

Magnetic total intensity observations off the coast of California delineate additional offsets of the magnetic anomaly lineations not previously reported. The lack of topographic expression of the minor magnetic anomaly offsets suggests what either the sedimentary cover masks small displacements or the source of the magnetic anomalies lies in the deeper part of the oceanic crust. A distinct change in amplitude, wavelength, and trend to the magnetic lineations occurs at approximately 124 degrees 20 minutes West. This change coincides with a hiatus in the pattern of the magnetic lineations and supports the contention that the process of sea-floor genesis was episodic rather than a continuous event. Author

N71-30987# Columbia Univ., Dobbs Ferry, N.Y. Hudson Labs.
PRELIMINARY EVALUATION OF A CORE SCINTILLATION COUNTER FOR BULK DENSITY MEASUREMENT IN MARINE SEDIMENT CORES
Chester Brier, Robert Bennin, and Peter A. Rona *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 11 p refs Repr. from J. Sediment. Petrol., v. 39, no. 4, Dec. 1969 p 1509–1519 *Its* Contrib. No. 351 (See N71-30980 18-13)
(Contract Nonr-266(84))
Avail: SOD $4.25

A core scintillation counter which measures transmitted gamma radiation was applied to determine wet bulk density of cores of marine sediment sealed in plastic liners. A preliminary evaluation indicates that two principle problems affecting accuracy of the bulk density determination are: (1) the radioactive source emits random radiations, which must be treated statistically to determine the dependence of counting accuracy on number of counts and (2) the Compton mass attentuation coefficient, which must be known in order to calculate density from scintillation counts, varies significantly with sediment composition and water content. Author

N71-30988# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
ISOSTATIC GRAVITY MAP OF THE EASTERN CARIBBEAN REGION
Sam A. Bush and Patricia A. Bush *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 5 p refs Repr. from Trans. of the Gulf Coast Assoc. of Geol. Soc., v. 19, p 281–285 (See N71-30980 18-13)
Avail: SOD $4.25

Thirty-nine newly reduced gravity stations are incorporated with other published and unpublished data to produce a Pratt-Hayford isostatic gravity map of the Antilles Islands and Venezuelan Basin. Negative and Positive isostatic anomaly belts of the West Indies island arc are delineated. Author

N71-30989# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
TRINCOMALEE AND ASSOCIATED CANYONS, CEYLON
Sam A. Bush and Patricia A. Bush *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 7 p refs Repr. from Deep-Sea Res. (London), v. 16, 1969 p 655–660 (See N71-30980 18-13)
Avail: SOD $4.25

Trincomalee and associated canyons conform to Ceylon's geological structure. Trincomalee Canyon crosses the insular shelf and slope with a general northeast trend similar to the strike of charnockite-khondalite series found on the island. Deviations in the canyon's strike result from joint planes and tectonic deformation. Two secondary canyons which also trend northeast align with north and south contact zones of Wanni gneisses and charnockite-khondalites. Author

N71-30991# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Lab.
OCEAN FLOOR IN THE DECADE AHEAD
Robert S. Dietz *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 2 p Repr. from Mar. Technol. Soc. J., v. 3, no. 5, Sep.–Oct. 1969 p 68–69 (See N71-30980 18-13)
Avail: SOD $4.25

The advancements to be expected in the fields of oceanography, geodesy, hydrography, and exploitation of marine environments are discussed. Subjects presented are (1) deep research vehicles, (2) deep-sea drilling project, (3) oceanography methods, (4) ocean floor resources, and (5) manpower requirements. Author

N71-30992# Environmental Science Service Administration, Miami, Fla.
PRIMITIVE EARTH: A MARINE GEOLOGISTS'S APPRAISAL
Robert S. Dietz *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 23 p Repr. from the Primitive Earth Symp., Spec. Publ. p D1–D11 (See N71-30980 18-13)
Avail: SOD $4.25

A discussion of the primitive earth in terms of the ocean floor which dominates the planet is presented. The theory of continental drift is discussed and examples to support the validity of the theory are described. The origins of mountain masses and other prominent earth features based on stratigraphic analyses are reported. Author

N71-30993# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
THE HISTORY OF THE EARTH'S CRUST
Robert A. Phinney, ed. and Robert S. Dietz *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 1 p Repr. from Mar. Technol. Soc. J., v. 3, no. 5 p 30 (See N71-30980 18-13)
Avail: SOD $4.25

A review of a book on the history of the Earth's crust is presented. The theory of continental drift is discussed with emphasis on: (1) the rheology and chemistry of the upper mantle, (2) the evidence from the continents, and (3) the evidence concerning drift from the ocean basins. The paleomagnetism of sediment cores as a new method of geochronology is described. Author

N71-30994# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
RICHAT AND SEMSIYAT DOMES (MAURITANIA): NOT ASTROBLEMES
Robert S. Dietz, Robert Fudali (Smithsonian Inst.), and William Cassidy (Pittsburgh Univ.) *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p refs Repr. from Geol. Soc. Amer., Bull., v. 80, no. 7, Jul. 1969 p 1367–1372 (See N71-30980 18-13)
Avail: SOD $4.25

The 38-km-diameter Richat Dome, in central Mauritania, has been widely regarded as a possible astrobleme. Our field examination of the structure and subsequent petrographic study of the critical rock types failed to reveal a single feature attributable to shock processes. We, therefore, dismiss an impact origin for this structure. It must, instead, be endogenic. The same conclusion applies to the much smaller, associated, Semsiyat Dome. Author

N71-30995# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
FIRST DEEP-SEA SOUNDING
Robert S. Dietz and Harley J. Knebel *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 7 p Repr. from Sea Fronties, v. 15, no. 4 p 212–218 (See N71-30980 18-13)
Avail: SOD $4.25

A brief history of early oceanography, ocean scientists, and equipment used to obtain depth measurements is presented. Limitations inherent in early methods of hydrographic surveying and ocean navigation are discussed. P.N.F

N71-30996# Pacific Oceanographic Lab., Seattle, Wash.
PROFILES OF MAGNETIC ANOMALIES SOUTH OF THE ALUETIAN ISLAND ARC
Barrett H. Erickson and Paul J. Grim *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 5 p refs Repr. from Geol. Soc. of Amer., Bull., v. 80, Jul. 1969 p 1387–1390 (See N71-30980 18-13)
Avail: SOD $4.25

Characteristic features of linear magnetic anomalies south of the Aleutian Island Arc are illustrated by a series of closely spaced anomaly profiles. Within the area, the anomalies change trend at the Great Magnetic Blight and are offset at several fracture zones and terminate where they intersect the Aleutian Trench. Author

N71-30997# Pacific Oceanographic Lab., Seattle, Wash.
HEAT FLOW MEASUREMENTS IN THE TASMAN SEA
Paul J. Grim *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 2 p refs Repr. from J. Geophys. Res., v. 74, no. 15, 15 Jul. 1969 p 3933–3934 (See N71-30980 18-13)
Copyright. Avail: SOD $4.25

In September 1967, 14 ocean bottom heat flow measurements were attempted in the Tasman Sea. Seven of these are considered successful and are presented. Author

N71-30998# Pacific Oceanographic Lab., Seattle, Wash.
SEAMAP DEEP-SEA CHANNEL
Paul J. Grim *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 29 p refs (See N71-30980 18-13)
(ESSA-TR-ERL-93-Pol-2) Avail: SOD $4.25

The SEAMAP deep-sea channel is a relic feature on the Aleutian abyssal plain south of the Aleutian trench. Along most of its 370-km length it has well-developed levees that are generally asymmetrical and differ in height. Typically the channel is about 50 m in depth and 6 km in width. From its northern end on the south wall of the Aleutian trench the channel floor rises towards the southwest from a depth of 4800 m to a minimum depth of 4590 m near its midpoint. Continuing in the same direction it deepens again to 4750 m. This gradient reversal precludes turbidity currents from flowing through the channel and supports the thesis that the Aleutian abyssal plain is a relic feature that has been cut off from its supply of turbidite material by the downbowing of the Aleutian trench. Author

N71-30999# Pacific Oceanographic Lab., Seattle, Wash.
FRACTURE ZONES AND MAGNETIC ANOMALIES SOUTH OF THE ALEUTIAN TRENCH
Paul J. Grim and Barrett H. Erickson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 7 p refs Repr. from J. Geophys. Res., v. 74, no. 6, 15 Mar. 1969 p 1488–1494 Revised (See N71-30980 18-13)
Copyright. Avail: SOD $4.25

Magnetic anomalies south of the Aleutian trench between 164 degrees and 180 degrees W trend east-west. The magnetic pattern is disrupted at 173 degrees W and 177 degrees 30 minutes W by north-south-trending fracture zones named Amlia and Adak fracture zones, respectively. Correlation of magnetic anomaly profiles shows apparent left-lateral offsets of 220 km across the Amlia fracture zone and 30 km across the Adak fracture zone. The amplitudes of the anomalies are sharply reduced where they intersect the trench, resulting in a magnetically quiet zone over most of the Aleutian trench and terrace. Although there are suggestions that the fracture zones extend north of the trench; the evidence is inconclusive. Author

N71-31000# Pacific Oceanographic Lab., Seattle, Wash.
FOSSIL DEEP-SEA CHANNEL ON THE ALEUTIAN ABYSSAL PLAIN
Paul J. Grim and Frederic P. Naugler *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 3 p refs Repr. from Science, v. 163, no. 3865 Revised (See N71-30980 18-13)
Avail: SOD $4.25

The discovery of a leveed deep-sea channel whose axial gradient reverses near the Aleutian trench supports the hypothesis that the downbowing of the trench interrupted the turbidity current processes that constructed the Aleutian abyssal plain. Author

N71-31001# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
POSSIBLE MORAINAL DEPOSITS IN THE GULF OF MAINE
Reginald N. Harbison *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 3 p refs Repr. from Mar. Sediments, v. 5, no. 1, p 19–21 (See N71-30980 18-13)
Avail: SOD $4.25

A detailed hydrographic, seismic reflection and magnetic survey was conducted in the northeastern Gulf of Maine. Bathymetric, bedrock, isopachous and total magnetic field intensity maps have been prepared. A 160-joule sparker provided the sound energy for the seismic work, and reflected signals were recorded on a dual-channel recorder. Frequencies were recorded between 300 and 600 Hertz on one channel and 600 to 1200 on the other. Author

N71-31002# Environmental Science Services Administration, Miami, Fla.
BOOK REVIEW OF MARINE GEOTECHNIQUE
George H. Keller *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 2 p refs Repr. from Mar. Geol. (Netherlands), v. 7, no. 2, 1969 p 176–177 (See N71-30980 18-13)
Avail: SOD $4.25

Marine geotechnique is the study of the engineering and scientific aspects of submarine sediments and rocks. To date these investigations have been primarily concerned with Holocene

deposits. This is a new and diversified field finding considerable interest among marine geologists and engineers who are concerned with the behavior of sea-floor deposits. The field of marine geotechnique is providing the marine geologist with a new approach to many of his problems. The book contains eighteen papers which have been organized under four major headings in such a way as to acquaint the reader not only with local studies made in various environments, but with specific problems such as slope stability, shock loading, sampling, in-place measurements, and laboratory analyses. The book is a collection of papers representing current research activities in marine geotechnique both in Europe and in the United States. Author

N71-31003# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
RADIOISOTOPES AND OCEANOGRAPHY
George H. Keller *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p refs Repr. from Isotop. Radiat. Technol., v. 6, no. 4, 1969 p 376–381 (See N71-30980 18-13)
Avail: SOD $4.25

A brief review of the literature indicates that, although radioisotope methodology in oceanography is not yet extensive, significant developments have been made. Radioisotope methods have been used for making observations directly in the environment and for tagging and dating both water masses and sediments. Only prototype nuclear instruments have been, in general, used thus far, but results obtained with them indicate the feasibility of using such instruments for measuring current velocity, oxygen content, deposited-sediment density, suspended-sediment concentration, and the elemental compositions of bottom sediments. Author

N71-31004# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
VERTICAL CRUSTAL MOVEMENT OF THE SEA FLOOR ASSOCIATED WITH THE PRINCE WILLIAM SOUND, ALASKA, EARTHQUAKE
Richard J. Malloy and George F. Merrill *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 12 p refs Reprinted (See N71-30980 18-13)
Avail: SOD $4.25

Hydrographic and ocean-bottom-scanning sonar surveys southwest of Montague Island, Alaska, to identify vertical crustal movement of the sea floor associated with the March 27, 1964, Prince William Sound Earthquake are reported. The survey was controlled by precision navigation and covered portions of the 1964 geophysical reconnaissance investigations during which sea-floor uplift in excess of 15 meters was discovered. A 21-kHz, conical-beam echo sounder was used for the depth soundings and a side-scanning sonar–with two laterally directed sonar beams of 150 and 160 kHz–to detect sea-floor features to a range of 366 meters to the right and left of the ship's trackline. Fresh fault scarps were traced seaward a distance of 19 kilometers. Data from the 1965 survey were used to prepare a bathymetric map of the uplifted area and, by comparison with presarthquake surveys, to construct profiles and a map showing the amount of sea-floor uplift. Lineaments detected by side-scanning sonar included scarps, strata ridges, and joint patterns. Areas of rock bottom yielded stronger reflections and more meaningful data than did areas of sediment. Author

N71-31005# Pacific Oceanographic Lab., Seattle, Wash.
GRAVITY ANOMALIES OVER THE ALEUTIAN TRENCH
Alexander Malahoff (Hawaii Inst. of Geophys.) and Barrett H. Erickson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 4 p refs Repr. from Trans. Amer. Geophys. Union, v. 50, no. 10, p 552–555
Avail: SOD $4.25

Interpretation of the gravity anomalies of the Aleutian trench is presented. In terms of crustal structure based on rock density-seismic velocity curves and seismic refraction profiles. A computer program was used to compute several theoretical free-air gravity anomaly profiles over two-dimensional geological sections. Author

N71-31006# Pacific Oceanographic Lab., Seattle, Wash.
BATHYMETRY OF THE NORTH INSULAR SHELF OF MOLOKAI ISLAND, HAWAII FROM SURVEYS BY THE USC AND GSS McARTHUR
Christopher C. Mathewson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 16 p refs Prepared in cooperation with Hawaii Inst. of Geophys (See N71-30980 18-13)
(HIG-69-21; DR-14) Avail: SOD $4.25

Bathymetric surveys are presented which show that the north insular shelf of Molokai is a smooth plain, gently dipping seaward, with three slight steps, one occurring between the 30- and 60-foot isobaths, one between the 150- and 180-foot isobaths and one near the 300-foot isobath. The shelf break occurs near the 500-foot isobath. Off East Molokai Volcano the shelf is cut by eleven submarine canyons; along West Molokai the shelf is unbroken except for one canyon. About half of the canyons have bowl-shaped heads; the remainder have V-shaped heads. The canyons originate about one mile offshore. Author

N71-31007# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
GEOPHYSICAL RECONNAISSANCE IN THE GULF OF TADJURA
Goerge Peter and Omar E. DeWald *In its* Atlantic Oceanog and Meteor. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 4 p refs Repr. from Geol. Soc. Am., Bull., v. 80, Nov. 1969 p 2313–2316 (See N71-30980 18-13)
Avail: SOD $4.25

Bathymetric and magentic surveys together with a seismic reflection line confirm the extension of the rift system from the Gulf of Aden westward into the Gulf of Tadjura are presented. West of 43 degrees 18 minutes E., however, the identification of the rift is tenuous, subject to individual interpretation. Author

N71-31008# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
MAGNETIC STRUCTURE OF THE JUAN de FUCA-GORDA RIDGE AREA
George Peter and Robert Lattimore *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 8 p refs Repr. from J. Geophys. Res., v. 74, no. 2, 15 Jun 1969 p 586–593
Copyright Avail: SOD $4.25

By using a fracture pattern with a different interpretation of the magnetic anomaly lineations, a reconstruction can be made in which the Juan de Fuca and Gorda ridges form a single, continuous, north-south trending feature. From this reconstruction, the present magnetic structural pattern can be derived by: (1) development of northwest-southeast oriented zones of weakness, (2) left-lateral motion along a system of northwest-southeast faults in the area of the Blanco fracture zone, (3) clockwise rotation and left-lateral motion of blocks north of the Blanco fracture zone, and (4) continued left-lateral offset along the northwest-southeast faults, in the course of which 250 km of the original ridge crest was destroyed and the individual faults were compressed into the present Blanco fracture zone. This interpretation explains the present magnetic structural configuration and elucidates some of the problems involved in the application of the transform-fault concept to this area. The anomalous structural fabric (which may be related to the coastal geology) and the agreement of the postulated motion of the Gorda block along the Mendocino fracture zone with known motion on the San Andreas fault zone suggest that the

Blanco fracture zone may have formed and the Juan de Fuca and Gorda ridges may have separated during the Late Tertiary coastal orogeny. Author

N71-31009# Columbia Univ., Dobbs Ferry, N.Y. Hudson Labs.
LINEAR LOWER CONTINENTAL RISE HILLS OFF CAPE HATTERAS
Peter A. Rona *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 10 p refs Repr. from J. Sediment. Petrol., v. 39, no. 3, Sep. 1969 p 1132–1141 *Its* Contrib. No. 348 (See N71-30980 18-13)
(Contract Nonr-266(84))
Avail: SOD $4.25

A field of lower continental rise hills situated on the seaward flank of the Hatteras Outer Ridge was investigated with a grid of bathymetric profiles, a continuous seismic reflection profile, and short (1.2 m) gravity cores. Throughout the field investigated, the lower continental rise hills are not isolated hills but rather are linear waveforms with fairly regular distribution and orientation. The waveform parameters are as follows: (1) trough-to-trough wavelength between 3 and 12 km, (2) trough-to-peak amplitude between 10 and 100 m, (3) crestal lengths of tens of kilometers, trending NW-SE and (4) asymmetric with 10 limb facing SW. Core samples recovered from the hills contain lutite and clay. The NW-SE crestal orientation and morphological similarity of these linear lower continental rise hills to megaripples or dunes are evidence that their development is related to deposition controlled by the deep Western Boundary Undercurrent, which flows southwest over the continental rise. The waveforms may extend down to reflection horizon A (Late Cretaceous-Eocene). The similarity of the waveforms to megaripples that extend continuously from horizon A to the present ocean bottom in the Argentine Basin implies that the North and South Atlantic have been open and intercommunicating at least since the initiation of the waveforms. Author

N71-31010# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
COMPARISON OF CONTINENTAL MARGINS OF EASTERN NORTH AMERICA AT CAPE HATTERAS AND NORTHWESTERN AFRICA AT CAP BLANC
Peter A. Rona *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 29 p refs Repr. from Amer. Ass. Petrol. Geol. Bull., v. 54, no. 1, Jan. 1970 p 129–157 (See N71-30980 18-13)
(Contract Nonr-266(84))
Copyright. Avail: SOD $4.25

The opposing continental margins of Cape Hatteras and Cap Blanc appear broadly symmetric with respect to (1) distribution physiographic provinces, with the exception of the lower continental rise hills which have not been observed off Cap Blanc, (2) early and middle Paleozoic, Mesozoic, and Cenozoic stratigraphic frameworks, (3) late Precambrian, Paleozoic, and Mesozoic tectonic frameworks, with certain qualifications, and (4) certain offshore residual magnetic anomalies, including a positive anomaly associated with the continental shelf edge and the boundary between smooth and rough magnetic fields. Author

N71-31011# Columbia Univ., Dobbs Ferry, N.Y. Hudson Labs.
MIDDLE ATLANTIC CONTINENTAL SLOPE OF THE UNITED STATES: DEPOSITION AND EROSION
Peter A. Rona *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 13 p refs Repr. from Amer. Ass. Petrol. Geol. Bull., Vol. 53, No. 7, Jul. 1969 p 1453–1466 Presented at the Geol. Soc. of Am. Northeastern Sect. Meeting, Washington, D.C., 16 Feb. 1968 *Its* Contrib. No. 361 (See N71-30980 18-13)
(Contract Nonr-266(84))
Avail: SOD $4.25

Continuous seismic reflection profiles across outer continental terrace (outer continental shelf and slope) show that directly off Cape Hatteras reflection interfaces (sedimentary strata) with low seaward inclination (< or = 1 deg) underlie the continental shelf and terminate at the continental slope, which inclines about 9 deg. On traverses about 200 km north of Cape Hatteras, reflection interfaces (sedimentary strata) do not terminate but incline about 3 deg, nearly parallel with the continental slope. On the continental slope about 100 km north of Cape Hatteras both relationships are present. Author

N71-31012# Columbia Univ., Dobbs Ferry, N.Y. Hudson Labs.
POSSIBLE SALT DOMES IN THE DEEP ATLANTIC OFF NORTHWEST AFRICA
P. A. Rona *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 3 p refs Repr. from Nature (England), v. 224, no. 5215, 11 Oct. 1969 p 141–143 (See N71-30980 18-13)
Avail: SOD $4.25

The presence of diapirs under the lower continental rise and abyssal plain off north-west Africa indicates that the salt basins of the continental margin may have extended seaward during the Late Triassic and Early Jurassic periods. Author

N71-31013# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic Labs.
MORPHOLOGICAL CONTINENTAL DRIFT FIT OF AUSTRALIA AND ANTARCTICA
Walter P. Sproll and Robert S. Dietz *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 4 p refs Repr. from Nature (England), v. 222, no. 5191, 26 Apr. 1969 p 345–348 (See N71-30980 18-13)
Avail: SOD $4.25

The jigsaw or morphological fit between South America and Africa was an important stimulus of early theories of continental drift, but it is only recently that the excellence of the fit has been demonstrated numerically. The problem of fitting together the southern continents around the Indian Ocean to form the Gondwana supercontinent is more difficult and remains unsolved. All fits so far proposed have a large central gap, although it is possible that submerged missing sialic pieces ("microcontinents") may be an answer to the problem. The best morphological fit between Australia and Antarctica by a precise and objective method is discussed. Author

N71-31014# National Hurricane Research Lab., Miami, Fla.
NUMERICAL EXPERIMENTS ON RING CONVECTION AND EFFECT OF VARIABLE RESOLUTION ON CELLULAR CONVECTION
Richard A. Anthes *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 20 p refs Sponsored by NSF (See N71-30980 18-13)
Avail: SOD $4.25

Ring convection is studied with Ogura's shallow moist convection model. Small-scale rings, 3 km diameter, grow at slower rates than single cells. Thirty-three percent of the updraft recirculates nearly uniformly inside the ring, with 67 percent descending outside the ring. Downdrafts associated with large-scale rings, 30 km in diameter, however, approach line symmetry, with 43 percent of the mass recirculating inside and 57 percent outside the updraft. The effect of variable radial resolution on cellular convection is also examined. Large-scale cellular convection described by a constant coarse resolution develops slowly because of artificial damping of the faster growing shorter waves. Author

N71-31037*# Scientific Translation Service, Santa Barbara, Calif.
THE ANTISYMMETRIC DIURNAL TIDE [LA MAREE DIURNE ANTISYMETRIQUE]

J. E. Blamont et al Washington NASA Nov. 1970 11 p refs Transl. into ENGLISH from Ann. Geophys. (Paris), v. 24, no. 2, 1968 p 381–385
(Contract NASw-2035)
(NASA-TT-F-13817) Avail: NTIS CSCL 08C

A rapid and precise method is proposed to solve the Laplace tidal equations. Using this method, and taking into account the different duration of the solar and sidereal day, the oscillatory modes of the antisymmetric diurnal tide are calculated. It is shown that the ensemble of the Hough functions is complete, each mode being associated with one of these functions. The variations of tidal mode with altitude can be deduced from their equivalent depths. Author

N71-31041+ Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly Bulletin, Jul.–Sep. 1968 [OBSERVATIONS D'OZONE, BULLETIN TRIMESTRIEL, 3e TRIMESTRE, 1968]
1971 21 p ref In FRENCH
Avail: NTIS

Spectrophotometric total ozone measurements are reported for the time July through September, 1968. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperatures, and used wavelengths. Transl. by G.G.

N71-31043 Washington Univ., Seattle.
A NUMERICAL STUDY OF ZONAL SYMMETRIC MOTIONS IN THE STRATOSPHERE AND MESOSPHERE
Walter Davidson Meyer (Ph.D. Thesis) 1969 194 p
Avail: Univ. Microfilms Order No. 70-14773

This study, through the use of a numerical model, examines the zonally symmetric aspects of the motion of the stratosphere and mesosphere. Radiative-photochemical heating and cooling are represented by Newtonian cooling and momentum dissipation by Fickian diffusion. Specified eddy heat flux and eddy momentum flux distributions are also examined. The nonlinear advective terms in the equations of motion are retained and the hydrodynamic and thermodynamic equations in spherical form are nondimensionalized for simplicity. The large annual variations in the zonal wind and temperature are examined first and Leovy's assumption in linearizing his equations is found to be justified. It is further found that the zonal wind maxima migrate slowly upward from 60km to 85km, a result of the specified increase in radiative relaxation time with height in that region. A downward migration of the mesopause during the winter season is also noted and discussed. Dissert. Abstr.

N71-31057# National Defense Research Organization TNO, The Hague (Netherlands). Physics Lab.
CALCULATION OF THE NATURAL ILLUMINATION
A. J. B. C. Bal Feb. 1971 31 p refs
(PHL-1971-8; TDCK-57776) Avail: NTIS

A description is given of the calculation of the natural illumination on a horizontal plane under a perfectly clear sky. The influence of cloudiness is shown and distribution functions are presented of the illumination with a clear sky and of the illumination with normal cloudiness for a one year period. Author

N71-31059 California Univ., Los Angeles.
THE SPECTRAL BEHAVIOR OF THE ATMOSPHERE IN THE FREQUENCY DOMAIN
Julia Elvira Nogues De Paegle (Ph.D. Thesis) 1969 249 p
Avail: Univ. Microfilms Order No. 70-14271

Time series analysis of atmospheric variables resolving scales between 20 minutes and 2 months are presented. The computations make use of the fast Fourier transform algorithm. The results obtained from spectral and cross-spectral analysis show that there are significant peaks in the spectra of wind components, temperature and pressure for most of the analyzed series. They appear variously at 2 months, 1 month, 3 and 2 weeks, 10, 4, 2 and 1 days. Bispectral analysis indicates that: (1) the nonlinear interactions which modify the kinetic energy spectra for the larger scales are determined mainly by the lower wave number range; and (2) the nonlinear interactions in the frequencies neighboring a peak (side bands) are at least as important as those in the peak itself. Dissert. Abstr.

N71-31060 Wisconsin Univ., Madison.
A SATELLITE STUDY OF LARGE STATIONARY POLYNYAS IN ANTARCTIC COASTAL WATER
Warren Willard Knapp (Ph.D. Thesis) 1969 130 p
Avail: Univ. Microfilms Order No. 70-3587

Nimbus satellite observations have been used to investigate large stationary polynyas, ice free areas in the midst of ice covered waters, during the winter season in the coastal waters of Antarctica. The results of the investigation show that large stationary polynyas are numerous and widely distributed in Antarctic coastal waters. It is concluded that the origin of these large polynyas is due to wind action removing the annual sea ice cover in the vicinity of fast ice or continental boundaries. Available evidence suggests that the size and position of the open water areas, with respect to the fast ice or other fixed boundaries at any given time, depends primarily on the intensity of the surface pressure gradient, the speed and direction translation, and the location of the center track of the prevailing synoptic system relative to the polynya site. Dissert. Abstr.

N71-31082 California Univ., San Diego.
PROTON MICROBURSTS
Anil Dave (Ph.D. Thesis) 1969 86 p
Avail: Univ. Microfilms Order No. 70-13675

A rocket observation of auroral protons during a substorm shows that the distribution function of the perpendicular energy repeatedly develops a large peak near 20 keV that is unstable over a time scale of a few hundred milliseconds; the repetition rate of the instability is between 3 and 10 Hz, and bursts of the integrated electron flux above 3 keV are associated with it. The altitude variation of the energetic protons above 20 keV implies a distribution function strongly peaked perpendicular to the magnetic field for the particles. The necessary conditions for the onset of a Type A electrostatic ion-cyclotron instability appear to be met, although a conclusive identification was not possible. Electromagnetic noise emission must result from these large, millisecond modulations of the energetic protons (the proton microbursts) many of which show high frequency structure approaching the local proton gyrofrequency. Dissert. Abstr.

N71-31083*# National Aeronautics and Space Administration, Washington, D.C.
DIURNAL VARIATIONS IN THE FLUCTUATIONS OF ELECTRON DENSITY IN THE IONOSPHERE OF THE NORTHERN HEMISPHERE [SUTOCHNYE VARIADII FLUKTUADIY ELEKTRONNOY PLOTNOSTI V IONOSFERE SEVERENOGO POLUSHARIYA]
E. S. Kazimirovskiy et al Dec. 1970 11 p refs Transl. into ENGLISH from Ionos. Issled. (Moscow), no. 15, 1968 p 77–84
(NASA-TT-F-13821) Avail: NTIS CSCL 04A

An attempt is made to connect the appearance of F-scatter with large scale electron density fluctuations in the F region of the ionosphere. From the analysis of data obtained from several ionospheric stations, a map of global P-index variations was constructed for the Northern Hemisphere, which is proportional to the electron density fluctuations. Characteristic zones of fluctuations for magnetically quiet and disturbed days are shown. Author

N71-31084*# Scientific Translation Service, Santa Barbara, Calif.
VISUAL ESTIMATES OF THE TWILIGHT SKY COLOR

FROM THE SOYUZ-5 SPACESHIP OBSERVATIONS [VIZUALVNYE OTSENKI TSVETA SUMERECHNOGO NEBA PO NABLYUDENIYAM S KOSHICHESKOGO KORABLYA SOYUZ-5]

K. Ya Kondratyev et al Washington NASA Dec. 1970 6 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 191, no. 4, 1970 p 824–825
(Contract NASw-2035)
(NASA-TT-F-13882) Avail: NTIS CSCL 04A

Results of a program to determine the twilight halo and color of the twilight sky using the Soyuz-5 satellite in 1969 are described. Results of other similar experiments are discussed. Author

N71-31080*# Scientific Translation Service, Santa Barbara, Calif.
POLARIZATION RADIATION MEASUREMENTS OF THE UNDERLYING SURFACE IN THE CENTIMETER RANGE [POLYARIZATSIONNYYE IZMERENIYA IZLUCHENIYA PODSTILAYUSCHEY POVERKHNOSTI B SANTIMETROVOM DIAPAZONE]

Yu. I. Rabinovich et al Washington NASA 11 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (USSR), no. 235, 1970, p 72–77
(Contract NASw-2035)
(NASA-TT-F-13812) Avail: NTIS CSCL 08M

The variation of horizonally and vertically polarized centimeter waves reflected from various surfaces on the ground is analyzed. Measurements were taken from an airplane with the sighting angle varying between 0.3 deg and 75 deg. Author

N71-31121*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
REMOTE EXAMINATION OF ROCK SPECIMENS

J. D. Burke, R. Choate, and R. B. Coryell *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 131–143 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 08G

Methods are being considered for extending the Apollo observations into a more complete understanding of the moon's bulk composition, mode of accretion, and thermal history. Studies and experiments have been made to determine (1) what performance can be expected from a minimum rover-borne system with imaging and sample manipulation, and (2) the advantages conferred by desirable additions, such as close-up color imaging, various types of microscopy, and chemical or mineral analysis using X-rays. Laboratory and field experiments support the feasibility of this prospect and identify some characteristics of an automated system. Author

N71-31147*# Scientific Translation Service, Santa Barbara, Calif.
TECHNIQUES OF SPACE GEOGRAPHY, WAYS OF DEVELOPING THEM AND THEIR USES IN STUDYING THE EARTH'S NATURAL RESOURCES [KOSMICHESKIYE METODY ZEMLEVEDENIYA, PUTI IKH RAZRABOTKI I PRIMENENIYA DLYA IZUCHENIYA PRIRODNYKH RESURSOV ZEMLI]

B. V. Vinogradov et al Washington NASA Jul. 1971 32 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geofiz. (Moscow), no. 2, 1970 p 86–102
(Contract NASw-2035)
(NASA-TT-F-13810) Avail: NTIS CSCL 08E

Methodology for studying the earth's natural resources is presented and the use of these space geography techniques in similar studies of other planets is demonstrated. Space geography is defined as the study of local, regional, zonal, and planetary relationships in the composition, structure dynamics, and rhythm of the geographic sphere. Space geography techniques consist of three major methods of integrating images of the earth from space observations: (1) territorial integration which involves unifying in one image, vast and spatially remote elements of the geosphere in large macro- and mega-structures; (2) factor integration which consists of uniting in one image all the physiognomic components of the geosphere, determining the relation between components in the landscape, and finding latent components of the geosphere using tracers; and (3) dynamic integration which is based on a comparison of successive images of the same territory, obtained by the same recorders with various time intervals. D.L.G.

N71-31227*# National Aeronautics and Space Administration, Washington, D.C.
ROTATION OF THE HORIZONTAL VELOCITY VECTOR IN ATMOSPHERIC TIDES [LA ROTATION DU VECTEUR VITESSE HORIZONTAL DANS LES MAREES ATMOSPHERIQUES]

J. E. Blamont et al Nov. 1970 10 p refs Transl. into ENGLISH from Ann. Geophys. (Paris), v. 24, no. 2, 1968 p 1–5
(NASA-TT-F-13818) Avail: NTIS CSCL 04A

The rotational direction of the horizontal velocity vector in atmospheric tides above 80 km was investigated. It is shown that there is no characteristic rotational direction associated with each hemisphere but that there is for each tidal mode, zones of latitude within which the rotational direction can be defined. This result, which comes from treatment of the tidal equations (without any hypotheses concerning the solution of the radial equation) is valid from ground level in the case of time related rotation. Author

N71-31267*# National Aeronautics and Space Administration, Washington, D.C.
THE SPECTRAL STRUCTURE OF THE RADIATIVE HEAT FLUX [SPEKTRALNAYA STRUKTURA LUCHISTOGO PRITOKA TEPLA]

K. Ya. Kondratyev et al Dec. 1970 19 p refs Transl. into ENGLISH from Probl. Fiz. Atm. (USSR), no. 7, 1969 p 3–21
(NASA-TT-F-13824) Avail: NTIS CSCL 04A

The results obtained from a determination of the spectral distribution of radiative heat fluxes at various levels in the atmosphere by using five models of the atmosphere (standard, dry summer, wet summer, dry winter, wet winter) are reviewed. Author

N71-31268# Environmental Science Services Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
A MAGNETIC AND BATHYMETRIC PROFILE IN THE PACIFIC FROM THE COCOS RIDGE TO CENTRAL CALIFORNIA

Albert J. Semtner (U.S. Coast and Geodetic Survey, Seattle) and Paul J. Grim Aug. 1970 14 p refs
(ESSA-TR-ERL-179-AOML-3) Avail: SOD $0.25

In late August and early September of 1969, the U.S. Coast and Geodetic Survey ship Oceanographer ran an uninterrupted deep sea trackline in the Pacific Ocean from an area south of Costa Rica to about 39 deg 30 min N off the coast of central California. The distance covered was approximately 3200 n miles. The magnetic and bathymetric data of this trackline is presented in profile form. Several of the more prominent aspects of the profile are discussed briefly. Author

N71-31288*# Scientific Translation Service, Santa Barbara, Calif.
COMPARISON OF THE CALCULATED VALUES OF THE ATMOSPHERIC LONGWAVE RADIATION BALANCE AND ITS COMPONENTS WITH THE DATA OBTAINED BY SATELLITE AND RADIOSONDE MEASUREMENTS [O SPAVNENII RASCHETNYKH VELICHNI BALANSA DLINNOVOLNOVOY RADIATSII ATMOSFERY I EGO SOSTOVLYAYUSHCHIKH S REZULVTATAMI SPUTNIKOVYKH I RADIOZONDOVYKH IZMERENIY]

L. N. Dyachenko et al Washington NASA Dec. 1970 11 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad),

1969 p 122–128
(Contract NASw-2035)
(NASA-TT-F-13823) Avail: NTIS CSCL 04A

Data from actinometric radiosondes and weather satellites were used to determine the surface and outgoing radiation on the earth. Two calculation methods were used for several stations in the U.S.S.R. Author

N71-31270# Institute for Defense Analyses, Arlington, Va. Jason Div.
EFFECT OF SURFACE ROUGHNESS ON THE SURFACE TEMPERATURE OF THE SEA
Fredrik Zachariesen Sep. 1970 17 p ref
(Contract DAHC15-67-C-0011)
(AD-722674; P-666; IDA/HQ-70-11694) Avail: NTIS CSCL 8/10

The effect of surface roughness on the surface temperature of the sea is calculated on the basis of a simple conduction and radiation model. This model assumes constant sky and water temperatures with conductive heat transfer through a thin boundary layer at the water surface. Analytic approximations are found for the change in surface temperature due to a pure wave disturbance and the differential change in surface temperature with differential surface roughening. Author (GRA)

N71-31278# Hawaii Inst. of Geophysics, Honolulu.
HEAT STORAGE AND ADVECTION IN THE NORTH PACIFIC OCEAN
Karl H. Bathen Jun. 1970 192 p refs
(Grant NSF GP-5534)
(PB-197661; HIG-70-6) Avail: NTIS CSCL 08J

An analysis is made of the processes maintaining the seasonal heat storage in the 0–250 meter surface layer of the North Pacific Ocean. Approximately 140,000 bathythermograph observations taken in the Pacific Ocean from 10 degrees South latitude to 70 degrees North latitude are used. Mean temperature profiles are computed for each month and are numerically integrated to find the total heat stored in the 0–250 meter surface layer. The monthly maps show the heat storage decreases eastward and northward from a maximum in the Western Tropical Pacific to a minimum in the Bering Sea. The seasonal amplitude of the heat storage was found to be greatest around Japan, off the coast of Alaska, and south of the Hawaiian Islands. Author (GRA)

N71-31284# Radiation Research Associates, Inc., Fort Worth, Tex.
COMPUTER PROCEDURE FOR CALCULATING TIME DEPENDENT LIGHT SCATTERING IN PLANE PARALLEL ATMOSPHERES Final Report, 1 Jul. 1968–31 Jan. 1971
Dave G. Collins and Michael B. Wells Apr. 1971 71 p refs
(Contract DASA01-68-C-0169)
(AD-722714; RRA-T7016; DASA-2641) Avail: NTIS CSCL 4/1

The report describes two Monte Carlo procedures that were developed for the purpose of providing calculational tools that could be used to study the transport of visible and infrared light in plane-parallel atmospheres. These procedures, designated as TPART-I and TPART-II, treat atmospheric scattering problems for point and plane parallel monochromatic sources, respectively. The TPART procedures consider the effect of Rayleigh and aerosol scattering and ozone, water vapor, CO_2, and aerosol particle absorption on the transport of light. The procedures also consider the changes in polarization that occurs at each scattering event. The input format of the codes allows one to describe the scattering and absorption properties of the atmosphere as a function of altitude. Provisions are incorporated for treating the ground surface with an albedo method. The output of the TPART procedures gives the scattered light intensity at each receiver position as a function of a polar and azimuthal angle and time. The procedures were written in FORTRAN-IV language for both the CDC-6600 and IBM Direct Couple Systems. The codes have been verified through comparisons with results of other calculations of light transport in the atmosphere. Author (GRA)

N71-31299# Ozeanographische Forschungsanstalt der Bundeswehr, Kiel (West Germany).
SAND TRANSPORT AND TURBULENCE [SANDTRANSPORT UND TURBULENZ]
G. Bosse Bonn Bundeswehramt 1971 38 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung (BMVg-FBWT-71-5) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

To understand the interaction between water current and seabottom sediment in shallow water, the turbulent motion and the sediment transport, as well as ripple formation, are investigated theoretically. ESRO

N71-31308*# Translation Consultants, Ltd., Arlington, Va.
EXPERIMENTAL DEMONSTRATION OF THE EXISTENCE OF A HYDROGEN ION FLUX IN THE EXOSPHERE [EKSPERIMENTALNOYE DOKAZATELSTVO SUSHCHESTVOVANIYA POTOKA IONOV VODORODA V EKZOSFERE]
A. P. Yaichnikov Washington NASA Aug. 1970 8 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 8, Jan.–Feb. 1970 p 151–153
(Contract NASw-2038)
(NASA-TT-F-13802) Avail: NTIS CSCL 03B

The detection of a hydrogen ion flux along the magnetic force lines of the earth is reported. It was found that in the middle latitudes of the Northern Hemisphere, this flux is directed toward the earth during the period from four to eight o'clock a.m. of the local solar time. The energy of the hydrogen ions was found to be below 4 eV. The absolute magnitude of the ion flux was also determined. Author

N71-31309# Environmental Protection Agency, Washington, D.C. Air Pollution Control Office.
AIR QUALITY CRITERIA FOR NITROGEN OXIDES
Jan. 1971 186 p refs
(PB-197333; NAPCA-Pub-AP-84) Avail: SOD $1.50; NTIS CSCL 13B

The chemical and physical characteristics of nitrogen oxides and the relative merit of various analytical methods for measuring them in the atmosphere are reviewed. Their effects on visibility, vegetation, and materials; their toxicological effects on animals and on man; and epidemiological studies that assess the general population dose response and the specific response of children to nitrogen oxides are also discussed. Author (GRA)

N71-31374# Naval Oceanographic Office, Washington, D.C.
SOME STATISTICAL CHARACTERISTICS OF COASTAL CURRENTS BASED ON AERIAL PHOTOGRAPHS [NEKOTORYE STATISTICHESKIE KHARAKTERISTIKI PRIBREZHNYKH TECHENII PO REZULTATAM AEROFOTOSEMKI]
I. Z. Konovalova et al 1971 20 p refs Transl. into ENGLISH from Tr. Gos. Okeanogr. Inst. (Moscow), v. 95, 1968 p 72–84
(AD-722839; NOOTrans-486) Avail: NTIS CSCL 8/3

Special observations using aerial photographs off the Caucasian coast of the Black Sea and in the Gulf of Riga of the Baltic Sea indicate that coastal currents in these areas have certain similarities. Their speeds and directions are related mainly to distance from the coast and not so much to geographic location or other circumstances. The observations made in conjunction with theoretical formulae characterizing coastal currents indicate that the mean velocity of surface coastal current increases with distance from the coastline. At a distance of 20-25km, the value is four times greater

than at a distance of 0-1 km. It was further indicated that the increase of mean velocities is rapid at the beginning, but that starting with 4.5-6.5km from the coastline, the rate of increase slows down rapidly, being 6cm/sec at a distance of 10km. Because the conclusions are based on a limited amount of data, they can be considered preliminary steps in the study of coastal currents with the aid of aerial photographs. Author (GRA)

N71-31403# Committee on Commerce (U.S. Senate).
AIR POLLUTION CREATED BY AIRCRAFT JET ENGINE EMISSIONS
Washington GPO 1970 39 p Joint Hearing Before Comm. on Com. and Comm. on Public Works, 91st Congr., 2d Sess., 4 Feb. 1970 Prepared in cooperation with Comm. on Public Works *its* Serial No. 91-85
Avail: Comm. on Com. and Subcomm. on Air and Water Pollution CSCL 13B

Statements on the development of engines and devices for the control of air pollution from jet aircraft engine emissions are presented. Research allocations for the reduction of smoke emissions are discussed as well as emission standards and the relocation of airports. J.M.

N71-31425# North American Rockwell Corp., Downey, Calif. Space Div.
NATURAL RESOURCE MANAGEMENT INFORMATION SYSTEM AND REMOTE SENSING APPLICATIONS. INFORMATION REQUIREMENTS STUDY FOR INDIAN OPPORTUNITY PROGRAM ECONOMIC IMPROVEMENTS
18 Jun. 1970 167 p refs Prepared for Bur. of Indian Affairs Original contains color illustrations
(SD-70-351) Avail: NTIS

The results of a preliminary study designed to aid the Bureau of Indian Affairs (BIA) in the evolutionary progression of natural resources management and of reservation economic improvement are presented as an over-view of the requirements for a natural resources management information system and of the potential application of remote sensing technology to natural resource programs. It presents the study rationale, objectives and scope; the major concepts of BIA programs, emphasizing natural resources; an outline of two remote sensing programs; a systematic orientation of BIA natural resources programs and problem areas with remote sensing applications; and the delineation of a natural resources management information system methodology. Author

N71-31432 Environmental Science Services Administration, Washington, D.C.
INTERNATION INDIAN OCEAN EXPEDITION, USC AND GS SHIP PIONEER, 1964. VOLUME 3: BATHYMETRY, GEOMAGNETIC, AND GRAVITY DATA, 11 FEBRUARY–11 AUGUST 1964
1969 253 p
Avail: SOD $3.00

The results of the Coast and Geodetic Survey ship Pioneer's 1964 cruise to the Indian Ocean are presented. Tabulations of the simultaneous depth soundings, magnetic field intensities, and gravity observations collected by Coast and Geodetic Survey personnel aboard the Pioneer are given. The trackline and types of data collected are shown for the Strait of Malacca and Andaman Sea; Bay of Bengal and northeast Indian Ocean; and South China, Java, Celebes, and Philippine Seas. Author

N71-31438+ National Oceanic and Atmospheric Administration, Rockville, Md. Marine Chart Div.
MAGNETIC SURVEY OFF SOUTHERN CALIFORNIA AND BAJA CALIFORNIA
A. E. Theberge, Jr. Apr. 1971 108 p refs
(NOAA-NOs-DR-12) Avail: NTIS

A residual magnetic anomaly map reduced by means of the International Geomagnetic Reference Field (IGRF) is presented. The map encompasses an area extending from 29 deg N to 40 deg N and 115 deg W to 127 deg W. These data were collected from March through September of 1970 by the NOAA Ship Surveyor. Distinct geologic provinces found within the mapped area include the southern California continental borderland, the Baja California Seamount Province which extends north to the Murray fracture zone, the central California continental shelf and continental slope, and a portion of the Pacific crustal plate between the Murray fracture zone and 40 deg N. The relationship between the anomaly patterns of these distinct areas are shown as well as zones where disruptions in the patterns occur. The map verifies previous surveys of the Pacific crustal plate as well as making new findings on the continental slope and shelf, in the Baja California Seamount Province, and on the continental borderland. Author

N71-31439# Max-Planck-Institut fur Physik und Astrophysik, Munich (West Germany).
STRIATIONS IN IONOSPHERIC ION CLOUDS. PART 1
Heinrich J. Voelk and Gerhard Haerendel Aug. 1970 56 p refs Submitted for publication
(MPI-PAE/Extraterr-50) Avail: NTIS

The occurrence of striated irregularities in ionospheric ion clouds is discussed. Striations can either be impressed on the cloud from the ambient medium or they may be generated by the cloud itself. In the first case the striations are simply tracers of small scale electric fields in their environment. To ascertain whether this is indeed the case, the stability problem of the cloud was investigated. It is pointed out that the cloud cannot be considered as an isolated object and that its interaction with the ionosphere is essential if striation formation by the cloud itself is considered. The shortcircuiting effect on cloud-generated polarization fields is considered in detail. The effect of the simultaneously generated image striations is discussed for a homogeneous ionosphere. It was found that the effect is very strong, and that a more realistic model of the ionosphere is needed for its final evaluation. Author

N71-31440# Denver Research Inst., Colo. Div. of Mathematical Sciences.
FOURIER ANALYSIS OF INITIAL VALUE PROBLEMS FOR SURFACE AND INTERNAL WAVES
Norman Bleistein, J. Cohen, and D. Hector Apr. 1971 26 p refs Supported in part by NSF
(Grant AF-AFOSR-70-1923)
(AD-722680; AFOSR-71-0986TR) Avail: NTIS CSCL 8/3

Two initial value problems are considered for the linearized equations of motion of an ocean of variable density and constant depth. The equations are cast in a dimensionless scaled form developed by the authors in a recent paper. In this form a large parameter is identified and the problems are amenable to Fourier analysis and asymptotic analysis of the resulting integral representations. Author (GRA)

N71-31480# Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
PHYSICAL PROPERTIES OF ALPINE SNOW AS RELATED TO WEATHER AND AVALANCHE CONDITIONS
M. Martinelli, Jr. Jan. 1971 43 p refs Prepared in cooperation with Colo. State Univ.
(PB-197487; USDA-FSRP-RM-64) Avail: NTIS CSCL 08L

Data were taken in avalanche starting zones at an elevation of 11,700 feet in the Front Range of Colorado within 14 days of deposition. Densities varied from 40 to 450 kg/cubic meter. Snow with unusually high density for its age found in 15 percent of the pits, was correlated with moderate to high windspeeds, low temperatures, and presence of wind-transported snow. Ram resistance was higher for alpine snow than for snow of same density

in trees. Air permeability was an order of magnitude less than expected and varied with the low flow rate used. Strength of snow of given density was greater for a certain permeability than for any other. Author (GRA)

N71-31487# Illinois State Water Survey, Urbana.
EFFECT OF COOLING TOWER EFFLUENTS ON ATMOSPHERIC CONDITIONS IN NORTHEASTERN ILLINOIS Preliminary Report
F. A. Huff, R. C. Beebe, D. M. A. Jones, G. M. Morgan, Jr. and R. G. Semonin 1971 37 p refs *Its* Circ. No. 100
(PB-197562) Avail: NTIS CSCL 04B

The potential effects of cooling tower effluents on atmospheric conditions around electric power plant installations are discussed. Heat and moisture outputs associated with cooling towers are compared with: (1) the size of naturally occurring fluxes of heat and moisture in the atmosphere; and (2) man made heat emissions from large urban areas. Potential weather effects from interaction between a lake breeze and cooling tower plumes are also considered. Application of existing cloud modeling techniques to aid in evaluating the potential for tower plumes to initiate, trigger, or intensify the development of clouds and precipitation downwind of the plant is described. Author (GRA)

N71-31488# Florida Univ., Gainesville. Water Resources Research Center.
PREDICTION OF SOLAR AND ATMOSPHERIC RADIATION FOR ENERGY BUDGET STUDIES OF LAKES AND STREAMS
W. C. Huber and Armando I. Perez 29 Oct. 1970 133 p refs
(Contract DI-14-01-0001-1628)
(PB-197267; WRRC-Pub-10W71-04020; OWRR-A-014-FLA) Avail: NTIS CSCL 08H

Evaluation of terms in the energy budget is an integral part of the prediction of thermal changes in natural water bodies. The net advective heat flux is often zero, in which case the radiation components are the dominant causes of temperature changes. Predictive methods for the two radiation components have been developed as a function of meteorological parameters alone. These predictive methods can be used in areas where there are no records of radiation measurements since the required meteorological variables are commonly measured at weather stations and airports. A better predictive equation was found for shortwave radiation than for longwave radiation. Author (GRA)

N71-31495# Ionospharen-Institut Breisach (West Germany).
IONOSPHERIC DATA: VERTICAL ECHO SOUNDING, JANUARY, 1971 [IONOSPHAEREN-DATEN: VERTIKAL-ECHO-LOTUNG, JANUAR, 1971]
Jan. 1971 44 p In ENGLISH and GERMAN
(Rept-295-F) Avail: NTIS

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany during January, 1971. The data include charts of the median values for the E and F regions, MUF(3000)F2, M(3000)F2, h'F2, hpF2, foF1, MUF(3000)F1, M(3000)F1, h'F, foE, FoE2, h'E, foEs, fbEs, h'Es, Type Es, foT, and fmin. Author

N71-31496# Ionospharen-Institut Breisach (West Germany).
IONOSPHERIC DATA: VERTICAL ECHO SOUNDING, MARCH, 1971 [IONOSPHAEREN-DATEN: VERTIKAL-ECHO-LOTUNG, MAERZ, 1971]
Mar. 1971 43 p In ENGLISH and GERMAN
(Rept-297-F) Avail: NTIS

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany during March, 1971. The data include charts of median values for the E and F regions, MUF(3000)F2, M(3000)F2, h'F2, hpF2, FoF1, MUF(3000)F1, M(3000)F1, h'F, foE, FoE2, h'E, foEs, fbEs, h'Es, Type Es, foT, and fmin. Author

N71-31497# Ionospharen-Institut Breisach (West Germany).
IONOSPHERIC DATA: VERTICAL ECHO SOUNDING, FEBRUARY, 1971 [IONOSPHAEREN-DATEN: VERTIKAL-ECHO-LOTUNG, FEBRUAR, 1971]
Feb. 1971 45 p In ENGLISH and GERMAN
(Rept-296-F) Avail: NTIS

Daily summaries are presented for vertical echo sounding of the upper atmosphere over Freiburg, Germany during February, 1971. The data include charts of median values for the E and F regions, MUF(3000)F2, M(3000)F2, h'F2, hpF2, foF1, MUF(3000)F1, M(3000)F1, h'F, foE, FoE2, h'E, foEs, fbEs, h'Es, Type Es, foT, and fmin. Author

N71-31503# Naval Postgraduate School, Monterey, Calif.
FEASIBILITY STUDY ON THE UTILIZATION OF PARACHUTE DROGUES AND SHORE BASED RADAR TO INVESTIGATE SURFACE CIRCULATION IN MONTEREY BAY
Howard Sanford Stoddard (M.S. Thesis) Mar. 1971 115 p refs
(AD-722561) Avail: NTIS CSCL 8/3

An intensive study is presently being made of the current patterns in Monterey Bay. Up to this time, no means has been available to examine the flow over the entire Bay. The feasibility of utilizing radar systems installed at the Naval Postgraduate School to track free-floating parachute drogues was investigated. Radar transponders extended the tracking range of the radars to include the north end of the Bay, and eliminated shadow zones which had been present when tracking passive reflectors. An analysis of the drogue tracks indicated the importance of the oceanic currents as primary current driving mechanisms. Tides strongly influenced flow in the Bays interior. Winds generally were a relatively unimportant driving mechanism, except when winds prevailed from one direction over an extended period of time. Author (GRA)

N71-31504# Naval Postgraduate School, Monterey, Calif.
SEA SURFACE AND RELATED SUBSURFACE TEMPERATURE ANOMALIES AT SEVERAL POSITIONS IN THE NORTHEAST PACIFIC OCEAN
Conrad Lucien Beland (M.S. Thesis) Mar. 1971 147 p refs
(AD-722587) Avail: NTIS CSCL 8/10

Sea surface temperature (SST) anomalies from previous sources have been related to subsurface temperature anomalies obtained from BTs at six positions in the Northeast Pacific. In this manner some understanding of the value of SST anomalies as indicators of ocean energy states is achieved. Results show that for about 50% of the time, the SST anomaly generally extended to depths of 100 meters or more. November through April were found to be the months most favorable for the occurrence of these deeply penetrating anomalies. Summertime SST anomalies were determined to be shallow features of less than 40 meters and were not indicative of subsurface heat content. A close linear relationship was observed year round between SST anomalies and heat content anomalies in the top 30 meters of the ocean. There was little correlation between SST and heat content anomalies in the 91-122 meter layer. Author (GRA)

N71-31553# Sandia Corp., Albuquerque, N.Mex.
ENERGY PARTITIONING DURING HYPERVELOCITY IMPACT ON ROCKS
Leslie R. Hill and Wallace E. Johnson (Systems, Sci. and Software, La Jolla, Calif.) Dec. 1970 23 p refs Presented at the 12th Symp. on Rock Mech., Rolla, Mo., 16–18 Nov. 1970 Sponsored by AEC
(SC-R-70-4402; Conf-701119-1) Avail: NTIS

As part of a continuing study of intense energy effects on the earth, such as explosive cratering for Plowshare, large scale hydrodynamic computer codes which numerically integrate the two-dimensional mass, momenta, and energy conservation equations were adapted for use on geological materials. Experimentally determined nonlinear dynamic equations of state

and constitutive equations governing material strength are incorporated into a two matr ıl Eulerian code, DORF. With the use of this code, impact studies were made of projectiles with arbitrary shapes in the r, z cylindrical plane normally incident on semi-infinite half space targets. The impact of projectiles on rocks was studied empirically and experimentally; however a theoretical approach is used here. Author (NSA)

N71-31581# New York Univ., N.Y. Geophysical Sciences Lab.
THE CALCULATION OF SOLAR RADIATION RECEIVED AND ABSORBED AT THE SEA SURFACE
Robert Dischel Jan. 1971 54 p refs
(Contract N00014-67-A-0467-0022)
(AD-723853; GSL-TR-71-2) Avail: NTIS CSCL 4/1

Methods of calculating monthly values of insolation based on cloud estimates are examined. A suitable form is chosen to predict insolation values for time increments as small as one hour. Smoothing of data gives a form for n, the proportion of insolation that is diffuse. By means of separate values for direct and diffuse solar input, sea surface albedo values are calculated from a semi-empirical equation. Author (GRA)

N71-31584# Massachusetts Inst. of Tech., Cambridge.
OCEANOGRAPHIC RESEARCH AT MIT IN THE DEPARTMENT OF EARTH AND PLANETARY SCIENCES AND OF METEOROLOGY Final Report, 15 Jan. 1961 - 31 Dec. 1970
Robert R. Shrock Apr. 1971 49 p refs
(Contract Nonr-1841(74))
(AD-723247; Rept-71-5) Avail: NTIS CSCL 8/10

The report summarizes the results of research in oceanography carried on at MIT under ONR sponsorship during the period 1961-1970. Author (GRA)

N71-31589# Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
ANALYSIS OF MAJOR RIVER SYSTEMS AND THEIR DELTAS: PROCEDURES AND RATIONALE, WITH TWO EXAMPLES
James M. Coleman and Lynn D. Wright 15 Apr. 1971 134 p refs
(Contract N00014-69-A-0211-0003)
(AD-723575; TR-95) Avail: NTIS CSCL 8/8

The great river and delta systems of the world are considered as complex, interacting systems. All components are causally interrelated. Salient process and response parameters have been identified, and procedures for acquiring and generating parameter values have been standardized. Geological, geomorphological, climatological, pedological, biological, and hydrological factors in the drainage basin, alluvial valley, deltaic plain, and receiving basin are being systematically measured, computed, and tabulated for each of 55 of the worlds major rivers and deltas. Means of accurately describing the morphometry of large drainage basins by rapid electronic techniques have been devised. Values obtained are considered in relation to the water balance, soils, vegetation, and river regime. In the alluvial valley similar factors are measured. In addition, a comprehensive descriptive classification of alluvial valley landscapes has been devised. In the delta such geomorphic and environmental parameters as the relative areas of various deltaic provinces, distributary patterns, landform types, river mouth and bar types, and deltaic bulge subaerial and subaqueous geometry are determined. Process parameters, including discharge, flood peakedness, sediment load, discharge efficiency, climate, etc., are considered as in the basin and alluvial valley. Author (GRA)

N71-31590# Northeastern Univ., Boston, Mass. Photochemistry and Spectroscopy Lab.
RESEARCH ON THE PHOTON ABSORPTION PROCESSES OF GASES IMPORTANT IN THE UPPER ATMOSPHERE Final Report, 1 Jan. 1968 - 30 Jun. 1970
John L. Roebber 31 Jul. 1970 129 p refs
(Contract F19628-68-C-0047)
(AD-723307; AFCRL-70-0431) Avail: NTIS CSCL 4/1

The results of investigations into the absorption processes of gases important in upper atmosphere chemistry and physics are presented. The principle region studied in the vacuum ultraviolet at wavelengths less than 3000 A. Methods of producing the OH radical in sufficient concentration to obtain its absorption cross-section are explored. New bands in the spectrum of methylamine and its deuterium derivatives have been found and their absorption cross-section measured. The effect of low temperature and the effect of a high pressure of argon on the absorption cross-sections of the 1760 A band of carbon suboxide have been determined. These results are used in conjunction with the Herzberg-Teller theory of vibrationally induced electronic transitions and an INDO molecular orbital calculation to assign the upper states of the 2650 A, 1760 A, and 1587 A bands of carbon suboxide. Author (GRA)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N71-30427# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
INDUCTIVE LIQUID METAL LEVEL DETECTOR
R. C. Walker Jun. 1970 27 p
(RD/B/N-1720) Avail: AEC Depository Libraries

Instruments were designed and developed to detect and measure levels of liquid metal coolants. These instruments measure the level to accuracies of + or − 1/8 in. without the necessity of inserting contacts or couplings into the sealed containment vessels, so reducing the risk of leakage through seals or weak points in its surrounding walls. Author (NSA)

N71-30440*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERY LONG BASELINE INTERFEROMETER (VLBI) EXPERIMENTS USING ATS SATELLITES: TEST PLAN
J. Ramasastry, R. D. Michelini, B. Rosenbaum Mar. 1971 19 p
(NASA-TM-X-65608) Avail: NTIS CSCL 14B

A test plan for conducting two Very Long Baseline Interferometer (VLBI) experiments is presented. The first experiment uses the Rosman – Mojave baseline and the ATS-3 satellite C-band transponder as a radio source. A test plan of this experiment is given. The second experiment uses one of the following three baselines: (1) Agassiz (Smithsonian Astrophysical Observatory) - Owens Valley (California) using ATS-5 L-band transponder as a radio source, (2) Rosman - Owens Valley (California) using ATS-3 C-band transponder as a radio source, or (3) Rosman - Agassiz using ATS-5 L-band or ATS-3 C-band modes. Author

N71-30449# Uppsala Univ. (Sweden). Inst. of Physics.
He-3-CRYOSTAT FOR SPECIFIC HEAT MEASUREMENTS
Torsten Lindqvist, Kurt Spahr, Karl Markland, Larp Hoel, and Mats Larsson Jan. 1970 26 p refs Supported by the Swed. Res. Council
(UUIP-677) Avail: AEC Depository Libraries

A conventional He-3 cryostat for measurements of specific heat in the temperature range 0.6 to 4.2 K is described. Data recording and data treatment is discussed. Calibration of Ge thermometers and measurements of the empty calorimeter are reported. Results from measurements on a copper standard sample are presented. Author (NSA)

N71-30469# Hamburg Univ. (West Germany). Institut fuer Experimentalphysik.
TRANSMISSION MOUNTED SILICON SURFACE BARRIER DETECTORS [SILIZIUM-OBERFLAECHENSPERRSCHICHT-DETEKTOREN IN TRANSMISSIONSFASSUNG]
G. Andersson-Lindstroem, E. Fretwurst, and W. Oelert Dec. 1970 27 p refs In GERMAN
(BMBW-FBK-70-27) Avail: AEC Depository Libraries

A fabrication method for silicon surface barrier detectors suitable for charged particle spectroscopy in nuclear physics was developed. The application as transmission-type detectors to be used at lower temperatures in telescopes was taken into special consideration. The fabrication technique and results on the detector performance are presented here. Special investigations on long term stability and temperature- and vacuum-stability, as well as dependence on material quality and geometry, are included. Author (NSA)

N71-30470# Bhabha Atomic Research Centre, Bombay (India). Technical Physics Div.
SURFACE BARRIER DETECTORS FROM p-TYPE Si
Ramesh Chaudhry and R. V. Srikantiah 1971 23 p refs
(BARC-527) Avail: AEC Depository Libraries

Surface barrier detectors have been fabricated from P-type Si in the resistivity range from 700 to 12000 ohms/cm. Detectors have been made with energy resolutions of 25 keV for 5.48 MeV Am-241 alpha particles with a sensitive area of 80 sq mm and a depletion depth of 150 microns. Depletion depths of 300 microns with a sensitive area of 250 sq mm have been obtained with 72 keV energy resolution for 5.48 MeV alphas. Some detectors have been made with evaporated guardring structures which improve the energy resolution. Leakage currents and their variations with time have been studied for encapsulated and unencapsulated detectors. Details of the method of fabrication and results are given. Variation of capacitance of the detectors with reverse bias has been studied and results confirm the abrupt junction formation. Author (NSA)

N71-30592*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SATELLITE ALTIMETER BIAS RECOVERY SIMULATION
John H. Berbert and Fred M. Loveless, Jr. (DBA Systems, Inc.) May 1971 44 p refs
(NASA-TM-X-65619; X-550-71-224) Avail: NTIS CSCL 14B

Simulations are made for bias recovery of a satellite-borne altimeter by means of data from various combinations of ground based range and angle measuring systems to determine the accuracy with which the altimeter bias can be recovered under these restricted conditions. Among the parameters considered are the number of stations, station geometry, elevation angle of the pass, and the relative amount of range or range with angle data used. The results indicate that, for the systems considered in these simulations, the two station network, with collocated lasers and cameras, is best with respect to accuracy, operational data collection probability, and minimum cost. Such a network is therefore recommended for the satellite altimeter calibration (GEOS-C). Author

N71-30660# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
LARGE VOLUME, MULTI-ELEMENT Ge(Li) SPECTROMETER
E. M. Lawson, A. J. Tavendale, and A. C. Dawson Nov. 1970 15 p refs
(AAEC/TM-572) Avail: AEC Depository Libraries

To make use of the good energy resolution of Ge(Li) spectrometers at gamma-ray energies of several MeV, the sensitive volume must be increased to beyond 100 cu cm. This volume is generally only attainable by operating several smaller spectrometers in parallel. Three coaxial Ge(Li) detectors were fabricated, assembled in a cryostat and operated in parallel. The spectral performance and relative efficiency of this multi-element spectrometer were investigated for gamma-rays of energies between 1 and 10 MeV. High energy gamma-rays (5–10 MeV) were obtained by thermalizing neutrons from a Pu–Be source and then absorbing them in materials with high cross sections for radiative capture. The experience gained is summarized and alterations to future multi-element spectrometers are proposed. Author (NSA)

N71-30708# Defense Documentation Center, Alexandria, Va.
GAS DETECTORS, VOLUME 1 Report Bibliography, Aug. 1960–Aug. 1970
Mar. 1971 75 p refs
(AD-722766; DDC-TAS-70-86-1-Vol-1) Avail: NTIS CSCL 14/2

The report contains annotated references on Gas Detectors compiled from the Defense Documentation Centers data bank. The range of the topics deals with detection of toxic propellants, odors, gas leaks, oxygen, etc. Included with the bibliographic reference are the corporate author-monitoring agency, subject, and title indexes. GRA

N71-30710# Vermont Univ., Burlington.
THE OPTICS OF RIPPLE TANKS Final Report
Nelson L. Walbridge and Howard M. Smith, Jr. 1971 37 p refs
(Contract Nonr-597(00))
(AD-722615) Avail: NTIS CSCL 14/2

Ripple tanks have been used for many years to study wave motion. Some device is used to create ripples on a liquid surface. More recently this device has almost invariably been a vibrating body at the surface of a liquid. The study of the wave form has been advanced by strobing a light source with the same frequency as that of the vibrating body. Several changes were made for the specific purposes of the work and are described. Many of the equations for the optical behavior of a ripple are independent of its specific wave form. So the first five sections of this report are treated in a general manner, deriving equations which can be applied to waves of various shapes. Author (GRA)

N71-30711# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
AN IMPROVED RESPIRATION MAGNETOMETER FOR LABORATORY AND DIVING STUDIES
William S. Manuel 16 Jul. 1970 15 p refs
(AD-722661; SMRL-634) Avail: NTIS CSCL 14/2

A model of a respiration magnetometer, similar to one described by Mead, was constructed at the Submarine Medical Research Laboratory in Groton, Connecticut, and has been modified recently for greater reliability and ease of operation. Good correlation between output signal and lung volume was found with supine subjects giving the most consistent results. The advantage of operation without mouthpiece, mask, or neck seal, and the instruments insensitivity to environmental changes, make it particularly promising for prolonged studies of gas exchange and for hyperbaric research. A system for streamlined calibration and data reduction is proposed. Author (GRA)

N71-30721*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTRUMENTATION FOR LIQUID HYDROGEN DENSITY MEASUREMENTS USING AN OPEN-ENDED MICROWAVE CAVITY
Jerry Smetana and Norman C. Wenger Washington Jul. 1971 28 p refs
(NASA-TN-D-6415; E-6/68) Avail: NTIS CSCL 14B

Two instrument systems that are used to make automatic and continuous measurements of resonant frequency are described and compared. These instruments can be used in conjunction with an open-ended microwave cavity to continuously monitor the

density of liquid hydrogen in a flow system. Also described is a prototype model of a cryogenic flow line section with a built-in cavity. A review of hydrogen density measurements using an open-ended microwave cavity is also presented. Author

N71-30723# Central Dockyard Lab., Portsmouth (England).
THE CDL CRACK DETECTOR AND TUBE TESTER
[1970] 5 p
(AD-720958; NSTIC-28182) Avail: NTIS CSCL 14/2

The C.D.L. Crack Detector was designed for the detection of cracks in tubes and bars of non-ferrous metals. In operation, it comprises a search probe which is a sliding fit around the bar under test and a portable battery operated instrument. The probe is moved along the bar and flaws are indicated by a lamp set for a predetermined fault level. A meter also gives an indication of minor faults below the threshold set for lamp illumination. The CDL Tube Tester is a development of the CDL Crack Detector designed for the inspection of heat exchanger tubes in situe. The operating frequency has been increased to 1 MHZ to reduce the depth of eddy current penetration in order to eliminate the effect of baffles and tube finning. GRA

N71-30724# Army Foreign Science and Technology Center, Charlottesville, Va.
DEVELOPMENT OF A TELESCOPE WITH A SIX METER MIRROR [PAZPABOTKA TELESKOPA S ZEPKALOM DIAMETROM 6 METROV]
B. K. Ioannisiani 24 Feb. 1971 29 p refs Transl. into ENGLISH from the book "Potunstisla B Podakugo" USSR, 1970 p 37–48
(AD-722624; FSTC-HT-23-059-71) Avail: NTIS CSCL 17/8

The article deals with the need for increased penetration and resolution of optical telescopes for research in modern astrophysics and the trend toward reflecting telescopes with prodded the construction of a special astrophysics observatory (SAO) with a 6-meter telescope mirror under the auspices of the U.S.S.R. Academy of Sciences. Parametric limits are surveyed from the standpoint of the 6-meter mirror as a maximum practicality. From there, logistics of planning, production, and operation are examined in detail, with a summary of general information about the special observatory included. Author (GRA)

N71-30730# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
METHODICS OF MEASURING THE INLEAKAGE IN THE LOW STRONG VACUUM FLASK
O. D. Pronin and V. G. Rogozinskii 1970 9 p refs In RUSSIAN
(IFVE-SKU-70-6) Avail: AEC Depository Libraries

The methodics of measuring the inleakage in the low strong flasks have been worked out and experimentally checked. Under a pressure of 560 torr it is possible to measure a specific inleakage with an error of about 0.01 sq cm at./hour 1. Author (NSA)

N71-30818*# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
INSTRUMENTATION FOR HYDROGEN SLUSH STORAGE CONTAINERS
D. H. Weitzel, R. S. Collier, D. A. Ellerbruch, J. E. Cruz, and L. T. Lowe 1 Jun. 1971 99 p refs
(NASA Order R-06-006-003; NASA Order H-2159A)
(NASA-CR-119241; NBS-9793) Avail: NTIS CSCL 14B

An experimental and analytical study of hydrogen liquid and slush tank gauging methods is described. The objective was continuous inventory of hydrogen slush during ground storage. Two approaches were taken, the first based on vapor-liquid and liquid-slush interface location, the second based on direct total mass sensing. Three interface location methods and three total mass methods were tried. Carbon film point sensors, previously used for vapor-liquid discrimination, were also successful for discrimination between triple-point liquid and settled slush. Time domain reflectometry was very successful for liquid level location and can be developed for settled slush level detection. Resonant cavity and capacitance methods were developed and demonstrated for accurate determination of total mass of liquid or slush without reference to liquid or settled slush levels. Author

N71-30820*# Pennsylvania Dept. of Transportation, Harrisburg. Bureau of Materials, Testing and Research.
EDDY CURRENT PROXIMITY GAGE FOR THE DETERMINATION OF THICKNESS OF PORTLAND CEMENT CONCRETE PAVEMENTS
R. L. Gray Jan. 1971 24 p refs
(Contract NAS8-22532)
(NASA-CR-119867) Avail: NTIS CSCL 14B

Multiple tests were taken with an eddy current proximity gage on specially prepared test slabs with aluminum plates and aluminum foil placed on the subbase prior to placing concrete. Calibration was found to be semi-logarithmic with greater sensitivity on six inch slabs than nine or twelve inch. A statistical treatment of data is presented to compare the gage to coring results. It appeared that with different calibration techniques, correction factors or gage modification, the instrument is well suited to detect concrete thickness when parallel reinforcement bars are used, but cannot detect pavement thickness when steel mesh or fabric reinforcement is used as in continuously reinforced concrete pavement construction. Author

N71-30844*# Rocketdyne, Canoga Park, Calif.
REACTIVE STREAM SEPARATION PHOTOGRAPHY Final Report
W. H. Nurick and J. D. Cordill [1971] 105 p refs
(Contract NAS7-720)
(NASA-CR-119246; R-8490) Avail: NTIS CSCL 14E

High speed photographic techniques were used to study impinging streams of N2O4/N2H4; N2O4/50-50, IRFNA/UDMH, and ClF5/N2H4 propellants in an experimental investigation of reactive stream separation. The high-resolution color motion pictures obtained show the detailed behavior of the liquid streams, spray fan, and individual droplets within the combustion zone. It was found that when reactive streams meet and form a spray fan, they may be cyclically and vigorously blown apart by a disturbance which could be a detonation or explosive deflagration, and then reform. This phenomenon was found to occur with N2O4/N2H4, N2O4/50-50 and IRFNA/UDMH, differing in average explosion strength according to the propellant combination. Cyclic blowapart frequencies and magnitudes were determined at variable impinging stream dynamic pressure ratio and jet diameters. Streak movies were also taken to determine the velocity and point of initiation of the disturbance. Author

N71-30932*# Bell Telephone Labs., Inc., Murray Hill, N.J.
PARTICLE DETECTION EQUIPMENT AND PARTICLE DATA PROCESSING
In its Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 4 p (See N71-30919 18-29)
Avail: NTIS CSCL 14B

Descriptions are given of the particle detection equipment and the data processing system used on Explorer 15 and Explorer 26. The particle detection equipment was designed to measure the spatial and angular distributions and energy spectra of electrons and protons in the radiation zones of the earth. The equipment for each satellite consisted of six diffused silicon p-n junction particle detectors, a bias power supply, and the associated electronics to form a flight unit. The data processing system was designed to telemeter all particle data originating in the detection equipment on the satellite to the ground and recording it on magnetic tapes. The data reduction process used with the magnetic tapes is described. D.L.G.

N71-31030*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LABORATORY EVALUATION OF THE PLASTIC VACUUM PROBE SURFACE SAMPLER

F. H. Farmer, J. J. Tulis (Becton, Dickinson and Co.), L. A. Taylor (Becton, Dickinson and Co.), and V. A. Pace, Jr. (Becton, Dickinson and Co.) 1971 13 p refs Presented at 10th Ann. Meeting Am. Assoc. for Contamination Control, Washington, D.C., 24–26 May 1971

(Contract NAS1-9398)

(NASA-TM-X-67253) Avail: NTIS CSCL 14B

An improved vacuum probe surface sampler, a device utilized to obtain specimens of the particulate contamination on surfaces, has been developed and has undergone a number of microbiological tests to determine if its removal or recovery efficiencies or reproducibility had been affected by either material or design changes. These tests indicated that none of these characteristics were adversely affected and that certain other modifications may be advisable. Author

N71-31074# Council for Scientific and Industrial Research, Pretoria (South Africa).

STRAIN GAUGE ACCELERATION TRANSDUCERS: PROPERTIES AND CALIBRATION [ANALIZA NIEKTORYCH WLASNOSCI I WZORCOWANIE TENSOMETRYCZNYCH CZUJNIKOW PRZYSPIESZEN]

1969 19 p refs Transl. into ENGLISH from Tech. Lotn. Astronaut. (Poland), v. 23, no. 9, 1968 p 15–19

Avail: NTIS

The choice of the membrane type strain gage as acceleration transducer and its design and construction are discussed. The selection of suitable types of foil strain gage, the glueing procedure, the circuit diagram, the calibration, and the evaluation of the calibration error are considered. Author

N71-31116*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.

USE OF PULSAR SIGNALS AS CLOCKS

P. Reichley, G. Downs, G. Morris *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 80–86 refs (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 14B

By comparing a pulsar clock with an earth-based atomic clock, several variations in the pulsar clock's frequency are noted. The major effect is due to the motion of the atomic clock in relation to the pulsar clock and contains information on the pulsar's position, elements of the earth's orbit, and solar relativistic effects. Another effect is the slowly varying frequency of the pulsar clock and contains information on the physics of the pulsar. The measurements of these effects and their present and future applications are discussed. Author

N71-31123*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMOCOUPLE TAPE Patent Application

Ralph D. Thomas, inventor (to NASA) 12 p Filed 8 Jan. 1971

(NASA-Case-LEW-11072-1; US-Patent-Appl-SN-104885) Avail: NTIS CSCL 14B

A thermocouple which may be rolled as tape and its use are described. Thermoelectrically different metals are applied to a strip of electrically nonconductive material in longitudinally overlapping relationship. Apertures may be provided along the tape in the overlapping region at predetermined intervals. An adhesive is applied to the side of the tape opposite the thermoelectric metals either before or after the thermoelectric metals are deposited. The tape may be cut or torn to form a thermocouple for application to a body whose temperature is to be monitored or measured. Official Gazette of the U.S. Patent Office

N71-31124# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

ALPHA-PARTICLE DENSITOMETER WITH VARIABLE RESPONSE

Werner Brandt (New York Univ.), Michael D. D'Agostino, and Anthony J. Favale Jul. 1971 8 p refs Submitted for publication

(RE-413J) Avail: NTIS

An alpha-particle gas densitometer is described with an instrument response that can be tailored to given specifications by shaping the energy distribution of the radioactive alpha source. Relations are derived to establish the connection between a specified densitometer response and the corresponding source distribution. Shaped sources can be constructed by mounting contoured baffles on alpha sources. The operation of the densitometer is demonstrated experimentally for a linear and a logarithmic instrument response to air density variations. Author

N71-31127*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD AND APPARATUS FOR MEASURING ELECTROMAGNETIC RADIATION Patent Application

Julian F. Been, inventor (to NASA) 8 p Filed 6 Jan. 1971

(NASA-Case-LEW-11159-1; US-Patent-Appl-SN-104346) Avail: NTIS CSCL 14B

An apparatus and method in which the capacitance of a semiconductor junction subjected to an electromagnetic radiation field is utilized to indicate the intensity or strength of the electromagnetic radiation are described. NASA

N71-31149# European Space Research Inst., Frascati (Italy).

A HIGH RESOLUTION, HIGH SENSITIVITY CHANNEL PLATE IMAGE INTENSIFIER FOR USE IN PARTICLE SPECTROGRAPHS

M. Galanti, R. Gott, and J. F. Renaud [1971] 19 p refs Submitted for publication Sponsored by ESRO

Avail: NTIS

Details are presented of an image intensifier for electrons using a channel plate, scintillator and fiber optics combination, which gives a reduction in exposure time of several thousand compared to a photographic plate. During the course of the investigation, measurements were made on the characteristics of the channel plate for various electron energies and angles of incidence. Author (ESRO)

N71-31198*# Sacramento Peak Observatory, Sunspot, N.Mex.

THE TEMPERATURE DEPENDENCE OF THE RESPONSE OF 103a-0 AND TRI-X AT 4400 A

Lou B. Gilliam and Dennis R. Hollars Jun. 1971 8 p refs Prepared in cooperation with Arizona Univ., Tucson

(Grant NGR-03-002-032)

(NASA-CR-119358; T-71-18) Avail: NTIS CSCL 14E

Exposures of one-half hour duration at 4400 A were made on 103a-0 and Tri-X emulsions over a temperature range of +20 C to −77 C. The response of the 103a-0 was essentially unaffected by cooling. However, the sensitivity of the Tri-X was strongly temperature dependent, and it showed a maximum response near a bath temperature of −56 C. Author

N71-31208 Cornell Univ., Ithaca, N.Y.

EXPERIMENTAL STUDIES WITH FLAT-PLATE, ION-DENSITY PROBES

Paul Rayment Grimwood (Ph.D. Thesis) 1970 91 p

Avail: Univ. Microfilms Order No. 70-14385

The probe for measuring the ion density in a high-velocity, continuum flow consists of a hollow cylinder with two consecutive ion-collecting electrodes at large negative potential. An ion boundary layer forms on the electrodes. The results established that, under conditions of practical interest, ion production within the sheath

can appreciably affect the currents drawn to the electrodes. The results were compared with measurements utilizing a microwave interferometer mounted with its beam transverse to the flow. Measuring the ratio of currents collected by the two electrodes directly provided the characteristic time for production. The free stream ion density followed from the characteristic time, together with the magnitude of the current drawn to the first electrode. The measurement of the characteristic time for production allowed a determination of the rate coefficient for the reaction N + O yields NO(+) + e. Dissert. Abstr.

N71-31251# National Bureau of Standards, Boulder, Colo. Quantum Electronics Div.

THE EFFECT OF TIME ORDERING ON THE LYMAN ALPHA PROFILE

J. T. Godfrey, C. R. Vidal, E. W. Smith, and J. Cooper Jun. 1971 17 p refs

(NBS-Monograph-121) Avail: SOD $0.30

Using a unified theory of spectral line broadening previously developed, the effects of time-ordering over the complete line profile are investigated. The behavior of the time-ordered thermal average and un-time-ordered thermal average are compared. The Fourier transform of the thermal average is obtained analytically. Calculations for the line profile of the Lyman-alpha line of hydrogen are presented and are representative in that the full thermal average is replaced by the thermal average with the electron velocity distribution approximated by function of nu equals sigma (nu − nu sub av) where nu sub av is the thermal velocity for the plasma in question. Author

N71-31382*# Lockheed-California Co., Burbank.

ORBITAL FATIGUE TESTER FOR USE IN SKYLAB EXPERIMENT T032. PHASE 1: DESIGN AND TESTING OF SPECIMENS HAVING VARIOUS SIZES Final Report

P. E. Sandorff and J. P. Sandifer 14 Jul. 1971 104 p refs

(Contract NAS1-9942)

(NASA-CR-111923; LR-24529) Avail: NTIS CSCL 14B

Constant amplitude axial load fatigue tests at a stress range ratio of R = 0.02 were conducted on various sizes of unnotched sheet specimens of Ti-6Al-4V titanium alloy and 2024-T3 aluminum alloy, to evaluate size effects and to determine a minimum size suitable for orbital fatigue test work in the Skylab spacecraft. Tests were also conducted to investigate the effects of extremes of humidity and to determine the S-N curve for Ti-6Al-4V material in a vacuum of 0.000001 torr. Strong size effects were found at stress levels below the proportional limit, which were in accordance with the statistical theory of strength. Two modes of failure under constant amplitude load were identified in Ti-6Al-4V materials; the mode that was in the very high stress/low cycle range was ductile in nature and not characteristic of fatigue. The effect of vacuum conditions was to reduce the stress level at which the ductile mode occurred by about 5% and to increase the fatigue life under the true fatigue mode by about 60 times. Author

N71-31383# National Oceanic and Atmospheric Administration, Rockville, Md. BOMAP Office.

HIGH LEVEL CLOUD PHOTOGRAPHY INVENTORY, BOMEX PERIOD 2, 24 MAY – 10 JUN. 1969

Vance A. Myers Mar. 1971 88 p

(NOAA-TM-ERL-BOMAP-4) Avail: NTIS

The high-level photography missions flown by U.S. Air Force RB-57F aircraft during the Barbados Oceanographic and Meteorological Experiment (BOMEX) Period II, May 24 – June 10 are identified. Tables and flight tracks give the time and location of each of the 1500 photographs taken. Author

N71-31384# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences and Life Sciences Sections.

DEVELOPMENT OF A PYCNOCLINE FOLLOWER FOR MEASUREMENT OF INTERNAL WAVES

R. L. Erath and M. A. Speidel Jun. 1971 20 p refs

(RM-513) Avail: NTIS

The design and construction of a neutrally buoyant oceanographic instrument for measurement of internal waves at the main pycnocline is discussed. The devices are entirely constructed of stainless steel and contain a pressure recorder to register depth variations of the instrument for periods up to thirty days. Author

N71-31399*# Weiser/Robodyne Corp., Silver Spring, Md.

AUTOMATIC PHOTOMETER SCAN AND DATA SYSTEM Final Report

May 1971 19 p

(Contract NAS9-11321)

(NASA-CR-115098) Avail: NTIS CSCL 14B

The Automatic Photometer Scan and Data System is a system composed of a positioning head which may be fitted to an optical bench and a control unit which controls the movement of the positioning head and integrates the electrical output of a photometer, the sensing head of which is moved by the positioner, and the coordinate location of the sensing head into a single printout. In normal application, this system will be used to test the uniformity of the light that would be incident on the film in a camera when the lens group is presented with a uniformly illuminated flat test surface on which to focus. Author

N71-31400# Naval Postgraduate School, Monterey, Calif.

EVALUATION OF AN ELECTRONIC WIND-TUNNEL BALANCE

Steven Russell Briggs (M.S. Thesis) Mar. 1971 61 p refs

(AD-722571) Avail: NTIS CSCL 14/2

A three-component electronic wind-tunnel balance installed in a 3.5 by 5.0 foot subsonic tunnel was evaluated for system problem areas. The nonlinear output of the reluctance gage transducers was analyzed and linearized using diode function-generating circuitry. A static calibration was conducted to confirm the linearity of the circuits. Evaluation of the balance system under operating conditions pointed out other areas for future investigation. Author (GRA)

N71-31401# California Inst. of Tech., Pasadena. Seismological Lab.

INSTALLATION OF STRAIN METERS AND A LONG PERIOD VERTICAL PENDULUM AT THE NEVADA TEST SITE Final Report

Stewart W. Smith 14 Dec. 1971 9 p refs

(Grant AF-AFOSR-1818-69; ARPA Order 292)

(AD-722451; AFOSR-71-0302TR) Avail: NTIS CSCL 19/4

A three-axis quartz strain gage with a sensitivity of 10 to the (-9) power was installed in Tunnel U12p at the Nevada Test Site and has been operated continuously since October 1968. During this time, permanent strain changes were observed as a result of several large explosions in this area. In addition, transient strains with time constants of many minutes were observed following explosions and tentatively to pressure decay in the cavity. The most recent collection of strain changes which were produced by the HANDLEY event show that on the average, the maximum strain offset is proportional to the inverse cube of the distance. This reinforces the early speculation that the region over which an explosion may significantly alter the local stress field is quite small, being tens of kilometers rather than hundreds of kilometers. Author (GRA)

N71-31421*# Stanford Research Inst., Menlo Park, Calif.

ANALYSIS OF ATS PHOTOGRAPHS USING A SPECIALLY DESIGNED ELECTRONIC CONSOLE, PHASE 1 Final Report, 8 Oct. 1969 – 8 Oct. 1970

Roy H. Blackmer, Jr., Eldon J. Wiegman, Sidney M. Serebreny, and

Rex G. Hadfield Oct. 1970 104 p refs
(Contract NAS5-21086; SRI Proj. 8244)
(NASA-CR-119317) Avail: NTIS CSCL 14E

The capability of the SRI/NASA electronic display system as an aid in the analysis and interpretation of ATS cloud data was assessed, and the limitations in obtaining useful information on cloud motion imposed by oblique viewing and/or resolution of the ATS camera were evaluated. This System applies the techniques of electronic scanning, storage, display, and data processing to the analysis of cloud imagery. A closed circuit television yielding time lapse viewing, plus electronic cursors to track and measure cloud motion, are some of the prime advantages of the equipment. Author

N71-31441# Bureau of Mines, Pittsburgh, Pa.
STRUCTURAL MODELS FOR THE DESIGN OF MINING SYSTEMS. ENCASEMENT OF STRAIN GAGE NETWORKS IN EPOXY
John R. Zelonka, R. J. Kline, and D. W. Mitchell Oct. 1970 35 p refs
(BM-RI-7442) Avail: NTIS

Models made by encasing strain gage networks in epoxy are described and evaluated. With this technique relatively complex models can be constructed in which any number of gages can be located and alined precisely. Although the gages are an integral part of the model matrix, they create no important mechanical or thermal stresses. Model construction techniques and experimental data proved reproducible and reliable. In addition, the solution obtained with these models to the problem of the state of stress around a circular hole in a plate subject to a plane stress condition was in agreement with theoretical, photoelastic, and finite element solutions. Author

N71-31442# Environmental Data Service, Silver Spring, Md.
CATALOG OF METEOROLOGICAL SATELLITE DATA: ESSA 7 TELEVISION CLOUD PHOTOGRAPHY, 1 JANUARY–31 MARCH 1969
1970 204 p refs *Its* Key to Meteorol. Records Doc. No. 5.321
Avail: SOD $2.00

A catalog describing the television cloud photography obtained by meterological satellites including material from ESSA 7, is presented. The material covers the period from January 1, 1968 thru March 31, 1969. There are two maps for each day; the first stereographic projection in each set is for the Northern Hemisphere and the second for the Southern Hemisphere. The maps are arranged according to pass day. E.H.W.

N71-31469# Daedalus Enterprises, Inc., Ann Arbor, Mich.
FABRICATION OF A SCANNING RADIOMETER Final Report, 27 Jun. 1969–15 Feb. 1971
Alan K. Parker 24 Feb. 1971 10 p
(Contract F19628-69-C-0301)
(AD-722863; DEI-4012-4; AFCRL-71-0152) Avail: NTIS CSCL 14/2

The report provides a summary of the program under which the design and fabrication of a calibrated scanning (imaging) radiometer was completed. The radiometer provides for two (2) controlled-temperature, field-filling reference sources adustable from -10C to +40C. The report lists the specifications and illustrates the completed system. Author (GRA)

N71-31470# Bell Aerospace Co., Buffalo, N.Y.
DESIGN AND DEVELOPMENT OF A 3-AXIS ACCELEROMETER (MESA) Final Report, 1 Dec. 1966–18 Dec. 1970
William G. Lange, Murry A. Meldrum, and Donald W. Honkala 18 Jan. 1971 51 p refs
(Contract F19628-67-C-0097)
(AD-722866; BA-6176-950002; AFCRL-71-0146) Avail: NTIS CSCL 14/2

This final report summarizes the work performed on the development of a Three (3) Axis Accelerometer. The accelerometers were developed for determination of atmospheric density at low satellite altitudes by sensing the satellite deceleration due to aerodynamic drag. Systems no. 1 and no. 2 were successfully flown on the Air Force low altitude density research satellites CANNON BALL I and SPADES respectively. Three triaxial accelerometer systems were delivered to AFCRL. The funded contract activity, which began on 1 December 1966, was completed on 18 December 1970 with the delivery of Three Axis System no. 3. Author (GRA)

N71-31478# Department of Agriculture, Washington, D.C. Agricultural Stabilization and Conservation Service.
ASCS AERIAL PHOTOGRAPHY STATUS MAPS
31 Jul. 1970 70 p
Avail: NTIS

A compilation of maps of agriculture, forest, and soil conservation service in the U.S. to determine the status of aerial photographic coverage is given. E.H.W.

N71-31554# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.
WIDE LATITUDE PROCESSING OF TRI-X-ORTHO OSCILLOGRAPHIC FILM
R. M. Shaffer and D. M. Dutton 15 Jan. 1970 47 p refs Sponsored by AEC
(EGG-1183-1465; L-974) Avail: NTIS

It is essential that the most appropriate film-developer combination be employed with a given imaging situation to obtain optimum results from photography. An experiment was designed to formulate and evaluate a developer (TEA-14) with similar characteristics for Tri-X Ortho film (TXO). The TXO-TEA-14 film-developer combination was found to yield an approximately equal P-11 phosphor film speed and higher shoulder resolving power with less image spreading and lower granularity than when TXO was developed in the commonly used Rapid X-Ray developer. Tri-X Ortho film processed to a low contrast in TEA-14 appears to be a considerable improvement over the same film processed in Rapid X-Ray developer when used for the processing of oscillographic signatures, particularly those with wide intensity ranges. Author (NSA)

N71-31573# Joint Publications Research Service, Washington, D.C.
DIGITAL FREQUENCY INSTRUMENTS WITH ANALOG REBALANCING
P. V. Novitskiy et al 22 Jul. 1971 35 p Transl. into ENGLISH from the book 'Tsifrovyye Pribory s Chastotnymi Datchikami' Leningrad, Energiya Press, 1970 p 353–384
(JPRS-53662) Avail: NTIS

The principles of constructing digital frequency devices with analog rebalancing are discussed, and characteristics are given of signal processing devices, trapezoidal pulse signals, and combination of electromechanical converters. Digital rebalancing devices with pulse frequency and pulse duration modulators are described, along with methods of improving the pulse shaping. Rebalancing integral values of measured variables and integrating rebalancing instruments with induction eddy current converters are also considered. N.E.N.

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N71-30691# Atomic Energy of Canada, Ltd., Pinawa (Manitoba).
THE CHEMICAL VAPOUR DEPOSITION AND BURST TESTING OF SILICON TUBES
E. Phillips and K. Lukas Feb. 1971 22 p refs
(AECL-3674) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.00

The chemical vapor deposition of small silicon carbide tubes is described. A hydrogen/methyltrichlorosilane molar ratio of 2.5:4.9 with a total flow rate between 1200 and 2240 ccm/min gave dendritic microstructures free from striations. Hoop tensile strengths of up to 52,587 lbf/sq in and 42,400 lbf/sq in were obtained with 0.25 in. ID and 0.5 in. ID tubes respectively. Author (NSA)

N71-30681# Central Research Inst. of Technology and Machine Building, Moscow.
EFFECT OF METAL REFINING LEVEL ON PROPERTIES OF HIGH-ALLOYED STEELS
E. P. Unksov, I. R. Kryanin, A. V. Ryabchenkov, S. A. Iodkovsky, V. S. Vul et al *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 7–28 ref (See N71-30680 18-17)
Avail: NTIS

The influence of the purity of metals cast either in open-type arc electric furnaces or in vacuum induction furnaces, on the properties and characteristics of high-alloyed austenite and ferrite steels is investigated. An examination is made of the effect of deoxidizing with the aid of silicon, calcium, and aluminum and the effect of casting in vacuum on the plastic properties of nickel-chromium steels. The effect of nitrogen, phosphorus, and sulfur on the resistance of the steels to corrosion cracking is also studied. It is concluded that in order to attain higher properties of high-alloyed steels it is vital that careful refining should take place. ESRO

N71-30682# Ministry of Iron and Steel, Moscow.
SOME PROPERTIES OF PHYSICAL AND CHEMICAL PROCESSES IN REFINING ELECTRIC REMELTING
V. V. Lempitsky, G. N. Okorokov, and V. A. Bojarshinov *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 29–44 refs (See N71-30680 18-17)
Avail: NTIS

An evaluation is made of the effectiveness of electroslag, vacuum, electron beam, and plasma-arc methods of remelting nickel-based steels and alloys. The advantage of each method is determined as the summary of its metallurgical possibilities and technical and economic factors. General problems of refining together with the peculiarities of ingot formation in furnaces and water-cooled crystallizer are also considered. ESRO

N71-30683# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). E. O. Paton Welding Inst.
ELECTROSLAG REMELTING OF SHAPED CASTINGS
B. E. Paton, B. I. Medover, G. A. Boiko, I. I. Kumysh, and L. V. Chekotilo *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 45–66 refs (See N71-30680 18-17)
Avail: NTIS

The electroslag refining process is described and its efficiency and advantages for manufacturing cast products are discussed. ESRO

N71-30684# Academy of Sciences (USSR), Moscow. Baikov Inst. of Metallurgy.
SOME REGULARITIES OF METAL REFINING AT PLASMA-ARC REMELTING
N. N. Rykalin, A. A. Erochin, and O. G. Kukleva *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 67–76 ref (See N71-30680 18-17)
Avail: NTIS

Features of plasma-arc remelting as a means of metal refining are discussed. The effect of process parameters such as electrode transfer of liquid metal and bath shape are considered and the mechanisms and kinetics of removing nonmetallic inclusions examined. ESRO

N71-30685# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). E. O. Paton Welding Inst.
PLASMA-ARC REMELTING OF METALS AND ALLOYS IN WATER COOLED MOULD
B. E. Paton and V. I. Lakomsky *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 77–92 refs (See N71-30680 18-17)
Avail: NTIS

A description is given of plasma-arc melting of metals and alloys in water cooled moulds. Among the points considered are the high temperature solubility of gases in liquid metals and the gas absorption by the liquid metals during the arc melting. The reaction kinetics of the gas-metal interactions are also discussed. ESRO

N71-30687# Academy of Sciences (USSR), Moscow. Baikov Inst. of Metallurgy.
EFFECT OF TEMPER ROLLING ON ELIMINATION OF YIELD PLATEAU IN VACUUM-TREATED LOW-CARBON STEELS
A. M. Samarin, V. S. Ivanova, V. F. Terentyev, L. M. Novik, and V. G. Poida *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 102–111 refs (See N71-30680 18-17)
Avail: NTIS

The effect of temper rolling process on elimination of yield plateau has been studied for a number of casts of vacuum-treated low-carbon steel (from 0.04 to 0.07% C) with the application of stress-strain curves. These studies have proved that the absence of yield plateau in sheet low-carbon steel, after the latter has been subjected to temper rolling with subsequent long-time seasoning at room temperature, is due to formation of a hardened surface layer, whose thickness is in excess of a certain (critical) value. Electrolytic removal of this layer has led to recovery of a yield plateau in all studied casts of vacuum-treated low-carbon steel. Author (ESRO)

N71-30731# Defense Documentation Center, Alexandria, Va.
ARC WELDING (INDUSTRIAL PROCESSING SERIES), VOLUME 1 Report Bibliography, Jul. 1961–Apr. 1970
Mar. 1971 73 p refs
(AD-722765; DDC-TAS-70-88-1-Vol-1) Avail: NTIS CSCL 13/8

The bibliography is an unclassified compilation of 49 annotated references on arc welding in a series of bibliographies on industrial processing. Computer-produced indexes for corporate author-monitoring agency, subject, and title are included. Author (GRA)

N71-30744# British Steel Corp., London (England). Metallurgy Dept.
THE TECHNIQUE OF SURFACE CARBURISATION PRIOR TO EXTRUSION
J. Kewell and G. Tither 1970 17 p refs
(PB-197129; MG/C/63/70) Avail: NTIS CSCL 13H

The advantages and problems associated with the technique of carburising prior to extrusion are discussed and the case and core properties for two carburised and extruded C-Mn-Si steels are reported. The results of adding niobium to one of these steels in order to refine the case structure is also discussed. Economic savings are likely to result from the technique of carburising prior to extrusion, especially if the quenching operation is carried out directly after extrusion. Author (GRA)

N71-30787# Finnish Academy of Technical Sciences, Helsinki.
THE EFFECTS OF THE PRACTICAL MACHINING PARAMETERS ON THE FORMATION OF A TOOL WEAR INHIBITING LAYER

Juha Pietikainen 1970 23 p refs *Its* Acta Polytech. Scand., Mech. Eng. Ser., no. 55
(PB-198083; APS-ME-55) Avail: NTIS CSCL 13H

By turning slightly hypoeutectoid carbon steel forming a wear inhibiting layer on the tool with a sintered insert, a study was made of the effects of depth of cut, feed, rake angle, nose radius, sintered insert carbide grade, and method of cutting on the maximum speed, nu sub KT, at which the wear inhibiting layer is still formed. The tests results show that nu sub KT decreases as the depth of cut and feed increase, a higher nu sub KT value is obtained with a positive than with a negative rake angle, moving from the lowest cutting speeds to the top speeds, and cutting with the same tool edge gives a higher nu sub KT value than cutting with a new tool edge. It was concluded on the basis of the test results that there is a surface nu sub KT = nu sub KT (s,t) in the s-t-nu axes, and the dependencies and significance of this were examined. Author (GRA)

N71-30807# Army Foreign Science and Technology Center, Charlottesville, Va.
HEAT AND MECHANICAL TREATMENT OF TITANIUM AND ITS ALLOYS. CHAPTER 5
M. L. Bernshteyn 12 Nov. 1970 65 p refs Transl. into ENGLISH from the book "Termomekhanicheskaya Obrabotka Titana i Ego Splavov" Moscow, 1968 p 1110–1165
(AD-722622; FSTC-HT-23-492-70) Avail: NTIS CSCL 13/8

The superiority of titanium alloys for use as construction material is discussed and the advantages of heat and mechanical treatment of specific titanium alloys including VT3-1, VT8 and VT14 are pointed out. Changes in treatment processes, including degree of deformation, quenching procedure, aging times and temperatures are shown to affect the mechanical properties of titanium alloys. Specific changes in mechanical properties, including tensile strength, plasticity and impact toughness are presented graphically. Optimal treatment conditions are developed for specified increases in strength and plasticity. The investigation includes comparative studies of the microstructures of alloys subjected to different mechanical and heat treatments. Author (GRA)

N71-30858# Royal Swedish Academy of Engineering Sciences, Stockholm.
VERTICALLY WELDED FILLET WELDS
Sven-Ake Persson 1970 42 p refs *Its* Acta Polytech. Scand., Mech. Eng. Ser. 50
(PB-197944; APS-ME-50) Avail: NTIS CSCL 13E

The two ways in which a fillet weld can be made in the vertical position with manual electrodes are described. These are moving of the electrode from below and upwards as well as from above and downwards. Different sizes of the fusion zone of the parent metal are obtained depending on the method used. The results show that variations in the depth of the fusion zone do not influence the static strength of the welded joint. The cooling rate of the weld influences the hardness in the transformation zone. Rapid cooling leads to the risk of the formation of martensite. Fine-grained steel could be satisfactorily welded with both methods. A cost comparison shows that the vertical downward welding method yielded the shallowest fusion zone but also could give a cost reduction of about 30 per cent. The gross efficiency of an electrode is not affected by the method of welding. Author (GRA)

N71-30859# Royal Swedish Academy of Engineering Sciences, Stockholm. Welding Commission.
UTILISATION OF THE PENETRATION FOR FILLET WELDS
Hans Ake Persson and Karl-Erik Gredborn 1970 86 p refs *Its* Acta Polytech. Scand., Mech. Eng. Ser. 51
(PB-197945; APS-ME-51) Avail: NTIS CSCL 13E

The penetration obtained with automatic submerged arc welding is very good and can be determined as a function of the current, electrode diameter and welding speed. The quality of the base material, its dimensions and the filler metal are of secondary importance. The weld quality is fully satisfactory for a penetration corresponding to a value of up to 100 per cent of the throat thickness. Submerged arc welding with a large penetration is fully comparable with manual welding as regards the static and dynamic strength and in certain respects even superior. The penetration in fillet weld can be tested ultrasonically by means of a halv-echo method, which has already been reported, or a new and in several respects better method, the zero-echo method. Author (GRA)

N71-30874# National Physical Lab., Teddington (England). Div. of Numerical and Applied Mathematics.
THE POSITION OF LIFTING HOOK STANDARDS UP TO MARCH 1971
T. A. E. Gorley Apr. 1971 11 p
(NPL-Ma-98) Copyright. Avail: NTIS

The position of both British and international standards for lifting hooks after the international meeting in Miami during October 1970 is given. Attention is paid to point-hooks, C-hooks, and marine C-hooks. ESRO

N71-30911# Technische Univ., Berlin (West Germany). Fakultaet fuer Maschinenwesen.
SLIDING POWDER LUBRICANTS IMPREGNATED WITH INTERMETALLIC COMPOUNDS [MIT INTERMETALLISCHEN VERBINDUNGEN GETRAENKTE SINTERGLEITWERKSTOFFE]
Wolfgang Hohmann (Ph.D. Thesis) 1969 134 p refs In GERMAN
Avail: NTIS

Iron-base metallic lubricants are evaluated for optimal sliding properties. Pressurized carbon penetration and sintering methods in a hydrogen atmosphere provided an iron powder structure impregnated with intermetallic Cd8Cu5 of optimal friction properties. Solidified Cu3Sb and Zn8Cu5 intermetallics did not improve the sliding properties of the iron powder lubricant. Transl. by G.G.

N71-30933# Central Dockyard Lab., Portsmouth (England).
A NEW FILLER WIRE FOR THE INERT-GAS WELDING OF GUNMETAL AND DISSIMILAR METALS
1970 6 p
(AD-721997; CDL-TM-HOS; NOCC-MEMO-N.134/70; NDCC-MEMO-HU25/70; NSTIC-27977) Avail: NTIS CSCL 11/6

Advances in gas shielded arc techniques, together with cast alloy development has encouraged a re-appraisal by M.O.D.(N) of the approach to gunmetal welding, and an improved filler wire was developed. The composition is based on work by the Canadian Department of Mines and Technical Surveys which led to the issue of Canadian Patent No.746,847 covering a phosphor bronze filler, to which silicon additions were made to assist in deoxidation of the weld pool and stabilization of the arc. The M.O.D.(N) project resulted in a nickel addition to the alloy which largely overcomes the weakening effect of grain boundary lead segregates by promoting globular dispersion, whilst achieving grain refinement, virtual freedom from porosity and overmatching strength. The composition of the wire which has a registered trade name PHOSNIC is given, together with two other wires which are considered for gunmetal welding. Author (GRA)

N71-31038 California Univ., Berkeley.
AN ANALYSIS OF THE FRICTION BONDING PROCESS
Udyavar Manohar Rao (Ph.D. Thesis) 1969 129 p
Avail: Univ. Microfilms Order No. 70-13143

The high speed repetitive sliding of cylindrical similar metal couples under high axial pressures up to various sliding progressions was investigated. The initial wear mechanism of the contacting surfaces for all metals under investigation was established as being due to tensile crack propagation caused by the release of elastic

energy from highly worked surface regions undergoing intermittent loading. The prominent wedge formation at the interface was recognized as being initiated by the interlocking of compatibly-oriented flake cracks on the surfaces which formed strong adhesion bonds. The importance of the torsional strains and the thermal gradients developed in the axial direction of the specimens towards flash formation was recognized. Generally lower axial pressures made flash formation more time and temperature dependent. Dissert. Abstr.

N71-31086 Michigan Univ., Ann Arbor.
AN EXPERIMENTAL INVESTIGATION OF THE ELASTOHYDRODYNAMIC LUBRICATION OF POINT CONTACTS IN PURE SLIDING
David Michael Sanborn (Ph.D. Thesis) 1969 220 p
Avail: Univ. Microfilms Order No. 70-14630

An experimental investigation of the elastohydrodynamic problem is described. The investigation was limited to a study of nominal point contacts in pure sliding motion. Both the profile of the lubricant film separating the bearing surfaces and the tractive force were determined during a normal loading transient of the bearing. During this time the Hertzian contact stresses were increased from zero to a maximum of 150,000 lbf/sq in in approximately 0.045 seconds. Both pure and polymer-blended naphthenic and paraffinic oils, in addition to several synthetic fluids, were studied under the above conditions. On the basis of the film thickness profiles and traction values obtained for the polymer-blended oils, it was concluded that the ambient value of viscosity often used in theoretical considerations does not characterize the behavior of the system. It was also found that the rapid application of the normal load had a negligible effect on both the film thickness profile and the traction. Dissert. Abstr.

N71-31128*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUTATION DAMPER Patent Application
Jack Evans, inventor (to NASA) 14 p Filed 18 Jan. 1971
(NASA-Case-GSC-11205-1; US-Patent-Appl-SN-107376) Avail: NTIS CSCL 13I

A nutation damper for use on a spinning body is described in which the damper is positioned parallel to the spin axis of the body and radially displaced therefrom. The damper is partially filled with a fluid and contains a porous media to impede the flow of the fluid induced nutation. NASA

N71-31134*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION, FRICTION, AND WEAR IN AIRCRAFT
Robert L. Johnson and Lawrence P. Ludwig [1971] 72 p refs Presented at 32d Meeting of Struct. and Mater., London, 28 Mar.–2 Apr. 1971, sponsored by AGARD
(NASA-TM-X-67872) Avail: NTIS CSCL 11H

Some anticipated and present friction and wear problems in aircraft are discussed and potential approaches for mitigation of these problems are outlined. The status of atomistic and continuum methods for defining surfaces and modes of failure is described. Wear processes are explored in terms of physical and chemical considerations and basic types of wear mechanics are characterized. Solid and liquid lubricant status is generalized. Lubrication by boundary, elastohydrodynamic, and fluid films are conceptually described. Lubrication systems are discussed in regard to future applications. Attention is given to particular problems of specific mechanical components (i.e., bearings, seals, gears, fasteners, etc.). Some approaches are suggested for the study of componnet wear due to fretting, erosion, scuffing, pitting, and other forms of damage. Author

N71-31209 California Univ., Berkeley.
THE SHAPING OF BRITTLE SOLIDS
Swaminathan Vaidyanathan (Ph.D. Thesis) 1969 165 p
Avail: Univ. Microfilms Order No. 70-13186

After an examination of certain fundamental aspects connected with brittle failure of solids, the statistical aspects concerning the bulk strength of brittle solids were reexamined from the point of view of extreme value theory in statistics. An investigation into certain mechanical processing methods of brittle solids was carried out. The mechanism of material removal by erosion in the case of brittle solids is different from that of ductile solids as the removal takes place mainly as a result of fracture produced owing to the tensile stresses that arise during the loading. Based on statistical considerations and the Hertz equations, the extent of damage is predicted and verified by loading a ball on to a plate of glass. The process of abrasion where hard abrasive particles fixed on to a cloth remove material by sliding action is examined. Based on the stress pattern around a sliding circular area of contact, a model for the fracture pattern is given and found to agree satisfactorily with that produced in a scratch test. Dissert. Abstr.

N71-31210*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY STUDY OF THE USE OF INFRARED RADIATION TO REVEAL LUBRICATION BEHAVIOR
L. D. Wedeven Jul. 1971 4 p refs
(NASA-TM-X-67883) Avail: NTIS CSCL 11H

The use of infrared radiation to investigate the formation and failure of lubricating films is described. The technique relies on the infrared radiation emitted from the bearing surfaces. Proper interpretation of the intensity distribution which is a function of temperature, emissivity, and interference effects reveals the lubrication behavior. Author

N71-31213# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE BOUNDARIES OF THE REGION OF STABLE EQUILIBRIUM OF A ROTOR IN PRESSURIZED GAS BEARINGS
R. Z. Aliyev et al 29 Jan. 1971 16 p Transl. into ENGLISH from Tr. Mekhan. i Protsessy Upr. Vychislitelnaya Mat. (USSR), no. 307, 1969 p 115–122
(AD-722828; FTD-HT-23-818-70) Avail: NTIS CSCL 13/9

A study is reported of the stability of the equilibrium state of a rotor in a pressurized gas bearing. The equations for the perturbed motion of the rotor are considered together with the Reynolds equations for the pressures in the lubricant layer. The conditions of equilibrium stability are established by the small perturbation method in a linear approximation. A numerical method of solving the basic equations is outlined, and the results of certain computer calculations are presented. GRA

N71-31222 Illinois Univ., Urbana.
INCIPIENT PLASTIC DEFORMATION IN ORTHOGONAL CUTTING OF 70/30 BRASS
Klaus Juergen Weinmann (Ph.D. Thesis) 1969 158 p
Avail: Univ. Microfilms Order No. 70-13533

The plastic deformation due to tool engagement and subsequent cutting of a plate of 70/30 brass was studied. The geometric arrangement is similar to orthogonal machining of metals. Two tool forces were measured by means of a strain gauge dynamometer: the cutting force, acting in the direction of cutting, and the thrust force acting perpendicularly to it. For all investigated rake angles and depths of cut, the cutting force increases monotonically in the early stages of the transient cut. As steady state cutting conditions are approached, the slope of the graph of the cutting force decreases with cutting distance, and three different slopes were detected on a logarithmic scale plot of the experimental data. Dissert. Abstr

N71-31223# Mound Lab., Miamisburg, Ohio.
HEAT SOURCE CAPSULE FABRICATION TECHNOLOGY PROGRAM, SEPTEMBER 1970–JANUARY 1971
D. E. Wendeln, W. C. Wyder, P. A. Tucker, and J. E. Newland
5 Mar. 1971 104 p
(Contract AT(31-1)-GEN-53)
(MLM-1796) Avail: NTIS

Developments in the program are reported. A hydroform press was installed and the manufacturing engineering phases were completed. All special hydroform tooling, machining fixtures, and gages were designed, built, and inspected in this same period. With the delivery of the hydroform blanks basic hydroform parameter and tooling development phase was started. This phase has been completed on all six capsule parts of the Transit design. Further dimensional refinements are being made such as the development of compensated punches to reduce the internal spherical radii deviations (and wall thickness deviations) and to reduce the out-of-roundness of the body parts at the open end. In general, the structures of the hydroformed components were found to be superior to those of comparable components made by deep drawing in terms of control of a fine uniform grain size. Author (NSA)

N71-31228*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC FILM THICKNESS BETWEEN ROLLING DISKS WITH A SYNTHETIC PARAFFINIC OIL TO 589 K (600 F)
Richard J. Parker and Jerrold W. Kannel Washington Jul. 1971
26 p refs
(NASA-TN-D-6411; E-6151) Avail: NTIS CSCL 11H

Elastohydrodynamic (EHD) film thickness measurements were made in an X-ray rolling-disk machine with a synthetic paraffinic oil at temperatures from 339 to 589 K (150 to 600 F). The synthetic paraffinic oil both with and without an organic phosphonate antiwear additive is capable of providing an EHD film throughout the range of test conditions. The measured film thicknesses were less than predicted by EHD theory when the lubricant was used without the antiwear additive. The antiwear additive caused an increase in the measured EHD film thickness. The measured film thickness was more sensitive to contact stress than predicted by EHD theory. For the oil without the antiwear additive, variations of measured film thickness with speed and viscosity were similar to those predicted by EHD theory. The film thickness measurements verified results of 120-mm- and 25-mm-bore ball bearing tests with the same lubricant. Author

N71-31272*# National Aeronautics and Space Administration, Washington, D.C.
ENCAPSULATION PROCEDURE ECCOFOAM FPH 12-4H EOLE MODULES [PROCEDURE D'ENCAPSULATION ECCOFOAM FPH 12-4H DES MODULES EOLE]
S. Clement Oct. 1970 14 p Transl. into ENGLISH from French report 69-173-CST-TE-TV-EOLE-S
(NASA-TT-F-13814; Rept-69-173-CST-TE-TV-EOLE-S) Avail: NTIS CSCL 13H

The characteristics of the potting mold, and the encapsulation procedure for the EOLE modules are described. The calculations of quantities of resin and catalyst used are presented. Author

N71-31320# Technische Univ., Berlin (West Germany).
EXPERIMENTALLY DETERMINED VALUES FOR THE BEHAVIOR OF FOETTINGER CLUTCHES AT PERIODIC DISTURBANCES OF STARTING AND DRIVING SPEEDS [EXPERIMENTELL ERMITTELTE KENNGROESSEN FUER DAS VERHALTEN VON FOETTINGER-KUPPLUNGEN BEI PERIODISCHER STOERUNG DER ANTRIEBS- UND ABTRIEBSDREHZAHL]
Eckard Ruediger Richter (Ph.D. Thesis) 1969 88 p In GERMAN
Avail: NTIS

The non-stationary behavior of hydrodynamic gears in power turbines is studied by analyzing parametric variations in hydrodynamic moments and their effects on blade operations. Performance tests and Fourier analysis of single transfer frequencies do not find any eigenfrequencies caused by the Foettinger clutch; damping of torsional oscillations in subsystems by the coupling or by the working liquid is minimized at higher frequencies. Interference frequencies above 10 Hz between the starting and driving elements of the coupling do not react with the agitated side of the element so that the system is dynamically decoupled. Transl. by G.G.

N71-31322# Technische Univ., Berlin (West Germany). Fakultaet fuer Maschinenwesen.
STATIC AND DYNAMIC STUDIES ON ECCENTRICALLY LOADED THREADED CONNECTIONS [STATISCHE UND DYNAMISCHE UNTERSUCHUNGEN AN EXZENTRISCH BELASTETEN SCHRAUBENVERBINDUNGEN]
Hartwig Weber (Ph.D. Thesis) 22 Feb. 1969 114 p refs In GERMAN
Avail: NTIS

Eccentric deformations of threaded connections are caused by bending of the screw and the resulting mechanical stress loads. Stress and static deformation measurements show that additive screw strains depend on the deformation in stressed parts of the threaded connections according to bending, E modulus and eccentricity of the force impact. The initial screw strain force has a marked effect on the limitation of the deformation and thus on its wear and long term life. Measurements on standardized rigid screws show that already small additive bending loads markedly decrease the dynamic stress margin. Transl. by G.G.

N71-31385# Joint Publications Research Service, Washington, D.C.
PROGRESS IN WELDING
B. Ye. Paton 30 Jun. 1971 15 p ref Transl. into ENGLISH from Avtomat. Svarka (USSR), no. 5, 1971 p 1–9
(JPRS-53493) Avail: NTIS

The development of welding procedures and techniques in the Soviet Union for the past ten years is discussed. Subjects presented are: (1) mechanization of welding, (2) semiautomatic welding, (3) microplasma-arc welding, (4) electron beam welding, (5) electroslag welding, and (6) multihead welding. Author

N71-31386# National Bureau of Standards, Washington, D.C.
US METRIC STUDY: THE MANUFACTURING INDUSTRY Interim Report
Jul. 1971 164 p
(NBS-SP-345-4) Avail: SOD $1.25

The implications of increasing worldwide use of the metric system on the manufacturing industry of the United States are discussed. It is based upon a questionnaire survey of the industry, which was asked for its views on the basic issues set forth in the Metric Study Act (Public Law 90-472). Because of the importance of measurement-related practices and standards to the manufacturing industry, it is vitally concerned with any possible changes in the U.S. measurement system. Author

N71-31394*# National Aeronautics and Space Administration, Washington, D.C. Technology Utilization Office.
ASSEMBLY TECHNOLOGY: A COMPILATION
1970 17 p
(NASA-SP-5934(01)) Avail: NTIS CSCL 13H

Information is provided in the area of assembly technology. Subjects discussed in this compilation represent innovations which were developed to accomplish assigned assembly tasks more efficiently and economically. Most of the items can be modified to fit a variety of requirements. Author

N71-31395*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORTRAN PROGRAMS FOR THE DESIGN OF LIQUID-TO-LIQUID JET PUMPS
Nelson L. Sanger Washington Jul. 1971 43 p refs
(NASA-TN-D-6453; E-6089) Avail: NTIS CSCL 13K

The one-dimensional equations describing noncavitating and cavitating flow in liquid-to-liquid jet pumps were programmed for computer use. Each of five programs was written to incorporate a different set of design input conditions. The programs may be used for any liquid for which the physical properties are known. Calculations for noncavitating and cavitating performance were combined, permitting calculation of cavitation limits within the program. Design charts may therefore easily be developed without the manual iteration which is common to existing design methods. Sample design problems are included to illustrate the use of each program. Author

N71-31471*# Hughes Aircraft Co., Culver City, Calif.
LUBRICATION FRICTION AND WEAR: SPACE VEHICLE DESIGN CRITERIA (STRUCTURES)
J. R. Jones NASA Jun. 1971 180 p refs Sponsored by NASA
(NASA-SP-8063) Avail: NTIS CSCL 11H

The significant experience and knowledge accumulated in research, development, and operational programs dealing with the processes of lubrication, friction, and wear is summarized for use in space vehicle development. Criteria are provided for the design of lubrication systems of bearings operating in space vehicle mechanisms. The related processes of friction and wear are discussed, particularly as they are effected by the space environment. Various types of lubricants, self-lubricating materials, and lubrication systems for space vehicles are compared. In addition, recommendations are given for methods of solving lubrication problems. D.L.G.

N71-31580# Avco Corp., Lowell, Mass. Systems Div.
MAGNETIC CRYSTALLOGRAPHIC ORIENTATION PRODUCED IN FERRITES BY HOT WORKING, 3 Annual Report, 5 May 1970 - 14 Mar. 1971
Robert M. Haag 14 Mar. 1971 18 p
(Contract N00014-70-C-0278)
(AD-723858; AVSD-0248-71-CR) Avail: NTIS CSCL 11/2

Forging of ferrite bodies of scaled-up sizes to two-inches diameter was successfully demonstrated. The excellent magnetic characteristics of forged ferrite material was maintained. Successful forge-welding of a non-magnetic gap material, in a ferrite during fabrication by forging techniques was demonstrated. This technique could eliminate the back gap reluctance associated with transducer or pick-up heads. Production costs of forged ferrite material could be significantly lower than hot pressed material due to the short times of forging compared to hot pressing. Author (GRA)

N71-31600# Technische Hochschule Carolo Wilhelmina, Brunswick (West Germany).
EXPERIMENTAL STUDIES ON UNLUBRICATED PIVOT BEARINGS MADE FROM EPOXY RESINS AND POLYIMIDES FOR FINE TOOLING TECHNOLOGY [EXPERIMENTELLE UNTERSUCHUNGEN AN UNGESCHMIERTEN ZAPFENLAGERN AUS EPOXIDHARZEN UND POLYIMIDEN FUER DIE FEINWERKTECHNIK]
Juergen Telschow (Ph.D. Thesis) 1970 160 p refs In GERMAN
Avail: NTIS

Experimental evaluations of epoxy resins containing solid lubricants and polyimide materials for applications as pivot bearing materials are reported. Considered are the effects of material combinations, sliding velocity, loads, and bearing clearance on the friction coefficients in unlubricated bearings. It is found that phenolic and epoxic resin compounds are good binding materials for solid lubricants and their effective friction coefficients depend on the sliding velocity as determined by their viscoelastic properties. Deformation properties depend on molecular chain flexibility, elongation and stress loads, and load duration. The mechanical properties and thermal stabilities of polyimide resins improve unlubricated bearing performance especially in a vacuum environment. Transl. by G.G.

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N71-30602# Oxford Univ. (England). Dept. of Engineering Science.
INTERACTIONS OF LASER BEAM WITH SOLIDS
S. Rafi Ahmad (Ph.D. Thesis) Mar. 1971 189 p refs Sponsored in part by Colombo-Plan Authority and Pakistan AEC
(Rept-1011/71) Avail: NTIS

To understand the different processes involved in the interaction of laser beams with metallic surfaces, the effect of photon absorption on metal surfaces was investigated and the results interpreted in terms of a temperature rise of the target surface. It was found that when a laser pulse was directed onto metal surfaces a plasma was generated. The properties of the plasma and its generation mechanism are also studied, together with reverse photoelectric effect. Finally the interaction of a Q switched ruby laser with cadmium sulfide is described. ESRO

N71-30763*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CLEAR-AIR-TURBULENCE DETECTION USING LASERS
Edwin A. Weaver *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 p 89-100 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 20E

The feasibility of detecting clear-air turbulence (CAT) was investigated using a CO2 laser Doppler system. The detection of aerosols in regions of CAT by a ground based ruby laser; the laser Doppler principle; and the airborne CO2 laser Doppler system are discussed. It is concluded that CAT detection and measurement appear feasible with a CO2 pulsed laser Doppler system. F.O.S.

N71-31087 Illinois Univ., Urbana.
GALLIUM ARSENIDE PLATELET LASERS
Jon Alexander Rossi (Ph.D. Thesis) 1969 123 p
Avail: Univ. Microfilms Order No. 70-13464

An extensive compilation of laser recombination data for GaAs is presented. All measurements are taken on optically pumped GaAs platelets (77 deg K) excited by a Ga(AsP) laser diode operated under pulse conditions. The platelet thresholds are experimentally determined for a large doping range and various cavity structures. The platelet thresholds are fairly uniform and low over this wide doping range, and thus reveal a major discrepancy with the commonly accepted theoretical calculations of semiconductor laser thresholds. Additionally, it was shown that spatial redistribution of optically created excess carriers inside the platelet does occur. In thin platelets (> or ~ 5 micrometers) carrier redistribution occurs very quickly, typically in times approximately 1 nsec. The laser recombination transitions involved (output wavelengths) in the operation of n-type, p-type and compensated GaAs platelets were also experimentally determined. Dissert. Abstr.

N71-31129 Illinois Univ., Urbana.
A THERMALLY-PUMPED CARBON DIOXIDE LASER
Michael Edward Fein (Ph.D. Thesis) 1969 90 p
Avail: Univ. Microfilms Order No. 70-13306

A carbon dioxide laser was constructed, operating at 9.6 microns and 10.6 microns, whose only energy sources were an oven and a vacuum pump. The device has generated 20 mW of power and has a peak single-pass small-signal gain of 11%. Because the thermally-pumped laser is essentially free of the effects of chemical reactions and charged particles, it provides a simplified environment for the study of molecular laser physics. Dissert. Abstr.

N71-31196 Cornell Univ., Ithaca, N.Y.
CHARACTERISTICS OF HIGH SPEED FLOWING N2-CO2-He GAS LASERS
John Allen Shirley (Ph.D. Thesis) 1970 94 p
Avail: Univ. Microfilms Order No. 70-17100

Measurements of small signal single pass gain and decay of spontaneous radiation from the asymmetric stretching mode of CO2 have been performed in a high speed flow in which convective effects dominate diffusive effects. Nitrogen, vibrationally excited in an rf discharge, is rapidly mixed with initially unexcited carbon dioxide. The results obtained for the radial and axial dependence of the gain coefficient are explained on the basis of numerical solutions of the governing fluid-kinetic equations using a three level model for CO2. The effects of viscosity and diffusion are included in the analysis, as well as the vibrational energy transfer and relaxation. Good agreement between theory and experiment is obtained. Unusually large gain coefficients, and favorable scaling characteristics have been observed. Using the rapid mixing technique the CO2-CO2 relaxation rate of the upper laser level has been measured using the radiation decay data. Dissert. Abstr.

N71-31420 Wisconsin Univ., Madison.
A STUDY OF A CONTINUOUS LASER BASED ON HYDROGEN CHLORIDE PRODUCTION IN SUPERSONIC FLOW
Knowles Arthur Overholser (Ph.D. Thesis) 1970 194 p
Avail: Univ. Microfilms Order No. 70-11850

The possibility of building a hydrogen chloride laser capable of continuous operation was investigated both theoretically and experimentally. The proposed laser does not rely on optical or electrical discharge energy pumps; it depends instead on chemical excitation of the vibrational rotational levels of hydrogen chloride produced in a hydrogen-chlorine detonation wave stabilized in supersonic flow at the exit of a nozzle. A theoretical study of laser gains in such a system is presented for a range of potential operating conditions. Experiments designed to study the feasibility of stabilizing a detonation wave in a laser cavity were carried out. Nozzle flames and unstable supersonic ignition were observed, but stable detonations could not be obtained. The experimental results make it possible to specify new construction materials and to recommend a modified nozzle design more conductive to effective reactant mixing. If these recommendations are adopted, hydrogen-chlorine detonations can probably be stabilized. Dissert. Abstr.

17 MATERIALS, METALLIC

Includ cermets; corrosion; physical and mechanical properties materials; metallurgy; and applications as structural materials. For basic research see; 06 Chemistry. For related information see also; 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N71-30428# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
DRY CORROSION OF LIGHT METALS OR ALLOYS [PROBLEMES DE CORROSION SECHE DES METAUX OU ALLIAGES LEGERS]
R. Darras 1970 58 p refs In FRENCH Presented at the Meeting on Corrosion Toulouse, 26-27 May 1970
(CEA-Conf-1729; Conf-701040-2) Avail: AEC Depository Libraries

Aspects of corrosion in electronuclear reactors are discussed. The nature of the corroding atmospheres and the related temperatures are examined. The possibilities of using Al, Mg, and Be, mostly in the form of alloys, are mentioned. Al spontaneously protects itself by the formation almost everywhere of a fine impermeable layer of alumina, and it is thus a metal very resitant to oxidation. Mg samples can withstand prolonged exposure to dry air at temperatures up to 400 C, the presence of water vapor reduces this temperature to 350 C. Spectacular methods for inhibiting corrosion beneath these temperatures exist. Furthermore the behavior of Mg towards CO2 at 500 C, which can be reached with the fuel cans, is excellent, even when considerable concentrations of water vapor are present. Phenomena particular to this utilization are indicated. In constrast, Be is very sensitive to traces of water vapor in gaseous atmospheres, particularly in CO2. Destructive corrosion occurs at 600 C, but can be completely eliminated by the addition of very small quantities of Ca or Mg. Author (NSA)

N71-30441# Centro Informazioni Studi Esperienze, Milan (Italy).
FURTHER EXPERIMENTS ON THE CORROSION RATE OF ZIRCALOY-2 IN STEAM-WATER MIXTURE UNDER REACTOR RADIATIONS
E. Cerrai, F. Gadda, and A. Scaroni Oct. 1969 19 p refs *Its* Topical Report No. 77
(Contract EURATOM-008.65.1-NTRI)
(CISE-R-290) Avail: AEC Depository Libraries

Samples of Zircaloy-2 were tested in in-pile water loops for corrosion. One set of tests was conducted under neutral steam-water conditions and another set was conducted using ammoniated steam-water mixtures. Data and information on corrosion and the effects of radiation are included. NSA

N71-30501# British Steel Corp., London (England). Inter-Group Labs.
PROJECT MG/DA/297: THE DETERMINATION OF TRACE AMOUNTS OF TANTALUM IN STEELS
1970 13 p refs Supersedes MG/D/576/69
(MG/D/431/70; MG/D/576/69) Avail: AEC Depository Libraries

In certain steels manufactured for nuclear engineering purposes, the presence of trace amounts of tantalum is highly undesirable because an active radioisotope is formed under neutron bombardment. Precipitation with phenylarsonic acid using niobium and zirconium as carriers forms the basis of a satisfactory procedure for the determination of this tantalum. Tantalum in the precipitate is isolated from interfering elements by solvent extraction and its content determined by the formation of a colored complex with pyrogallol. The method is not rapid, and a batch of six samples plus a reagent blank would require more than one day for completion. Trials of an alternative, more rapid method, using phenylfuorone as colorimetric reagent, in which preliminary precipitation is unnecessary, were less satisfactory. Author (NSA)

N71-30521*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION OF ALLOYS IN NICKEL-ALUMINUM SYSTEM WITH THIRD ELEMENT ADDITIONS OF CHROMIUM, SILICON, AND TITANIUM AT 1100 C
Gilbert J. Santoro, Daniel L. Deadmore, and Carl E. Lowell Washington Jul. 1971 29 p refs
(NASA-TN-D-6414; E-6225) Avail: NTIS CSCL 11F

The oxidation behavior of 31 compositions in the gamma(Ni), gamma'(Ni3Al), and beta(NiAl) phase regions of the Ni-Al system containing 0, 1, 3 or 10 atom percent Cr, Si, or Ti was investigated. Specimens were isothermally and cyclically exposed in air at 1100 C (2012 deg F) for 100 hours. Alloy thickness changes and weight changes were measured. The oxidation products were

examined by X-ray diffraction and by metallography. Combining all results from these observations, a qualitative comparison is made of the oxidation resistance of all compositions studied.
Author

N71-30524*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRACTICAL METHOD FOR DIFFUSION WELDING OF STEEL PLATE IN AIR
Thomas J. Moore and Kenneth H. Holko Washington Jul. 1971 25 p refs
(NASA-TN-D-6409; E-6236) Avail: NTIS CSCL 13H

A simple and easily applied method of diffusion welding steel plate in air is described. Feasibility was clearly established for the diffusion welding of butt joint in AISI 1020 steel without the use of a vacuum furnace or hot press. The diffusion welds equaled the strength of the parent metal and passed a 180 deg bend test. These results are believed to have considerable potential in basic industry and aerospace applications since elaborate vacuum hot presses and related equipment are not required to make the diffusion welds.
Author

N71-30566# Atomic Energy of Canada, Ltd., Chalk River (Ontario).
ENVIRONMENTALLY INDUCED CRACKING OF ZIRCONIUM ALLOYS. 3: CRACKING IN HOT AND FUSED SALTS
B. Cox Jan. 1971 25 p refs
(AECL-3799) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.00

Predominantly transgranular cracking of Zircaloy-2 and Zircaloy-4 specimens was observed with deposits of LiCl/KCl eutectic, NaCl and CsI at 350 C and in fused eutectic mixtures of sodium and potassium nitrate with potassium iodide at 300 to 450 C. Cracking was not obtained in any medium with U-bend specimens, but split-ring specimens stressed initially to the yield point cracked readily. A number of batches of tubing of various textures were all cracked, although the time to failure varied from batch to batch. The measured time for crack propagation was a minor fraction of the total time to failure, the time for crack initiation being the major fraction. In fused salt mixtures of nitrate and chloride or nitrate and bromide at 300 to 450 C severe intergranular penetration occurred even in the absence of stress. In the latter mixture traces of chloride are thought to act as activators. No cracking, but severe pitting was obtained in fused nitrate/fluoride mixtures.
Author (NSA)

N71-30632*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF COLUMBIUM ALLOY WC3015
A. A. Tavassoli Washington Jul. 1971 26 p refs
(NASA-TN-D-6390; M-366) Avail: NTIS CSCL 11F

The effect of changes in basic composition and additions of alloying elements on mechanical properties of columbium alloy WC3015 is reported. A 500-ppm addition of yttrium to the basic composition plus an anneal for 1 hr at 1093 C (2000 F) is shown to provide a superior combination of properties with a ductile-to-brittle transition temperature below -129 C (-200 F). Nevertheless, the oxidation resistance of WC3015 is shown to be inadequate for a typical reentry environment. The oxidation rate of WC3015 is shown to be parabolic at 1316 C (2400 F), resulting in an oxidation rate higher than Cb752, for times less than 40 min. It is concluded that since oxidation resistance obtained at the expense of ductility and elevated temperature strength is not justified for thermal protection system application, more emphasis should be placed on improving ductility, elevated temperature strength, and creep. Substitution of over 10 percent of the hafnium by tantalum and elimination of titanium are suggested for improving the above properties.
Author

N71-30648# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Radiochemie.
PHASE EQUILIBRIUM IN THE SYSTEMS Th-O2-UO(2+x), CeO2-UO(2+x), AND NpO2-UO2(2+x) [PHASENFLEICHGEWICHTE IN DEN SYSTEMEN ThO2-U-O(2+x) CeO2-U-O(2+x), UND NpO2-U-O2(2+x)]
Robert Paul Oct. 1970 78 p refs In GERMAN; ENGLISH summary
(KFK-1297) Avail: AEC Depository Libraries

The study of the phase diagram of the ternary systems Th-U-O for the region ThO2-UO2-U3O8 between 1100 and 1550 C was undertaken by means of chemical analysis and X-ray investigations, as well as metallographic and spectroscopic techniques. Up to 1100 C the following phases were obtained: a two phase region consisting of orthorhombic beta-U2O8 and cubic U4O9, the phase width being temperature dependent and reaching 45 mole% ThO2 at 1100 C; the Th sub nU(1-n)4O9-phase (n < or = 0.5) with a superstructure of the U4O9-type; a two-phase region, in which M4O9(M = Th + U) and MO sub 2+x coexisted; and a fluorite phase (MO sub 2 + x), extending all over the composition range. Above 1100 C the two phase region (beta-U3O8 and M4O9) extended from pure beta-U3O8 at 1550 C up to 36 mole% ThO2, at 1250 C up to 43 mole% ThO2. (The cubic M4O9-phase with a superstructure did not exist in this temperature range.) The phase width increased with rising temperature. No solubility for ThO2 and CeO2 in beta-U3O8 was observed. In the system NpO2-UO(2+x) a solubility of NpO2 in beta-U3O8 was determined.
Author (NSA)

N71-30676*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
DEVELOPMENT OF DUCTILE HIGH STRENGTH CHROMIUM ALLOYS
A. M. Filippi 26 Nov. 1970 108 p refs
(Contract NAS3-12427)
(NASA-CR-72883; WANL-TNR-228) Avail: NTIS CSCL 11F

Chromium alloys strengthened solely by a group IVB or VB metal carbide or boride precipitate were examined to define phase stability up to approximately 2900 F and identify the most potent strengtheners. Carbides and borides of zirconium and hafnium were the least effective strengtheners, and those of tantalum most effective. Columbium and titanium compounds displayed a strengthening effect somewhat between these extremes. As fabricated alloys, reduced > 90% from ingot to rod to approximately 2100 F, ranged in tensile strength at 2100 F from approximately 10 ksi for the compositions Cr-.5Hf-.5C(a/o) and Cr.5Zr-.5C, to approximately 55 ksi for Cr-.5Cb-.5B and Cr-.5Te-.5B. Ductile-brittle transformations of the alloys occurred from 100 F to 700 F and were directly related to strength. Rupture life at 2100 F was typically < 25 hours for alloys tested at 15 ksi in the as fabricated condition and < 15 hours for tests at 12 ksi on recrystallized material. A major improvement in rupture strength at 2100 F was obtained by heat treating several alloys which displayed phase transformation behavior. Heat treatment consisted of first annealing above 2700 F followed by rapid cooling to form and retain the Cr23C6 or Cr4B phases. Following this, alloys were aged a short time at 2100 F to begin the carbide or boride interchange reactions.
Author

N71-30680# Royal Swedish Academy of Engineering Sciences, Stockholm.
CLEAN STEEL, VOLUME 2
1971 129 p refs Presented at the Soviet-Swed. Symp., Sandviken, Swed., 24 - 26 Mar. 1971
(IVA-Medd-169-Vol-2) Avail: NTIS

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1. EFFECT OF METAL REFINING LEVEL ON PROPERTIES OF HIGH-ALLOYED STEELS E. P. Unksov (Central Res. Inst. of

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2. SOME PROPERTIES OF PHYSICAL AND CHEMICAL PROCESSES IN REFINING ELECTRIC REMELTING V. V. Lempitsky (Min. of Iron and Steel), G. N. Okorokov (Min. of Iron and Steel), and V. A. Bojarshinov (Min. of Iron and Stee) p 29–44 refs (See N71-30682 18-15)

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4. SOME REGULARITIES OF METAL REFINING AT PLASMA-ARC REMELTING N. N. Rykalin (Acad. of Sci., Moscow), A. A. Erochin (Acad. of Sci., Moscow), and O. G. Kukleva (Acad. of Sci., Moscow) p 67–76 ref (See N71-30684 18-15)

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6. EXTENT OF OXYGEN EXTRACTION FROM IRON-CARBON MELTS IN VACUUM G. G. Glavin (Acad. of Sci., Moscow), Y. A. Karpov (Acad. of Sci., Moscow), L. B. Kuznetsov (Acad. of Sci., Moscow), I. M. Pronman (Acad. of Sci., Moscow), A. V. Revyakin (Acad. of Sci., Moscow) et al p 93–101 refs (See N71-30686 18-17)

7. EFFECT OF TEMPER ROLLING ON ELIMINATION OF YIELD PLATEAU IN VACUUM-TREATED LOW-CARBON STEELS A. M. Samarin (Acad. of Sci., Moscow), V. S. Ivanova (Acad. of Sci., Moscow), V. F. Terentyev (Acad. of Sci., Moscow), L. M. Novik (Acad. of Sci., Moscow), and V. G. Poida (Acad. of Sci., Moscow) 102–111 refs (See N71-30687 18-15)

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9. DEPENDENCE OF THE SURFACE AND INTERPHASE TENSIONS OF THE STEEL UPON SILICON CONCENTRATION N. A. Vatolin (Inst. of Metallurgy) and V. F. Uchov (Inst. of Metallurgy) p 116–124 refs (See N71-30689 18-17)

10. TECHNOLOGY AND PROPERTIES OF METALLIC MATERIALS A. M. Samarin (Acad. of Sci., Moscow) p 125–126 (See N71-30690 18-17)

N71-30686# Academy of Sciences (USSR), Moscow. Baikov Inst. of Metallurgy.

EXTENT OF OXYGEN EXTRACTION FROM IRON-CARBON MELTS IN VACUUM

G. G. Glavin, Y. A. Karpov, L. B. Kuznetsov, I. M. Pronman, A. V. Revyakin et al *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 93–101 refs (See N71-30680 18-17)
Avail: NTIS

The presence of a systematic error is shown in detecting oxygen in iron-carbon melts having a carbon content above 2%. The data given here illustrate the absorption of oxygen by the surface of an iron-carbon melt. The amount of the absorbed oxygen is proportional to the amount of the free carbon. The oxygen isotope O 18 was used for determing the extent of extraction of oxygen in vacuum. The sensitivy was 0.000005% (weight). It is shown that the total amount of oxygen is from 10 to 100 times greater than the amount of dissolved oxygen. Author (ESRO)

N71-30688# Academy of Sciences (USSR), Moscow. Baikov Inst. of Metallurgy.

STUDY OF CONSTITUTIONAL DIAGRAMS IN THE USSR

N. V. Ageev *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 112–115 refs (See N71-30680 18-17)
Avail: NTIS

A historical study of phase diagrams in the USSR is presented. ESRO

N71-30689# Institute of Metallurgy, Sverdlovsk (USSR).

DEPENDENCE OF THE SURFACE AND INTERPHASE TENSIONS OF THE STEEL UPON SILICON CONCENTRATION

N. A. Vatolin and V. F. Uchov *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 116–124 refs (See N71-30680 18-17)
Avail: NTIS

A study is made of the effect of silicon on the interfacial properties of liquid metals when steel is ladle-treated with chromium ore and vanadium slag during vacuum treatment. Due to the fact that reduction of the chromium and vanadium starts immediately, the surface tensions as well as the interfacial properties were investigated for silicon concentrations. ESRO

N71-30690# Academy of Sciences (USSR), Moscow.

TECHNOLOGY AND PROPERTIES OF METALLIC MATERIALS

A. M. Samarin *In* Roy. Swed. Acad. of Eng. Sci. Clean Steel, Vol. 2 1971 p 125–126 (See N71-30680 18-17)
Avail: NTIS

Past and future requirements of metallic materials are reviewed. ESRO

N71-30806# British Steel Corp., London (England). BISRA-The Corporate Labs.

EFFECT OF LOADING RATE ON CREEP PROPERTIES OF AISI TYPE 316

[1970] 8 p
(PB-197128; MG/QD/126/70) Avail: NTIS CSCL 11F

The initial rate of load application was found to have no significant effects on the results of the creep tests on AISI Type 316 at 650C, and therefore a single standard loading rate does not appear to be necessary for this material; however, in general, mean loading rates should be selected to suit the material and creep test conditions, in order to provide consistent testing techniques and help to eliminate scatter in creep results. Author (GRA)

N71-30808*# General Electric Co., Cleveland, Ohio. Engineering Section.

DEVELOPMENT OF FABRICATION PROCESS FOR METALLIC FIBERS OF REFRACTORY METAL ALLOYS Final Report

L. H. Amra, L. F. Chamberlain, F. R. Adams, J. G. Tavernelli, and G. J. Polanka 28 Oct. 1970 176 p refs
(Contract NAS3-7906)
(NASA-CR-72654) Avail: NTIS CSCL 11F

Developed are process techniques for the production of small diameter refractory metal alloy wires. The wires are incorporated into superalloy matrices, with the ultimate objectives of providing a fiber reinforced superalloy composite, for applications in advanced turbojet engines. The goal for the drawn wire is a stress-to-density ratio of 125,000 inches for a rupture life of 3,000 hours in a temperature range of 2000 F to 2200 F. Author

N71-30809*# Fulmer Research Inst., Ltd., Stoke Poges (England).

THE DEVELOPMENT OF PRECIPITATION-HARDENED CHROMIUM-BASE ALLOYS Final Report

E. A. Brandes and B. A. Hatt 24 Mar. 1971 53 p refs
(Contract NASw-1720)
(NASA-CR-72874; FRI-R-304) Avail: NTIS CSCL 11F

An exploration of chromium based alloys, precipitation

hardened by means of intermetallic compounds formed between Zr-Si, Ti-Si and Ti-Be failed to produce useful materials. Strong creep resistant alloys were found in the systems Cr-Ti-C and Cr-Cb-C and Cr-Ta-C. The Cr-Ti-B and Cr-Cb-B systems were less promising because of Cr4B formation. Author

N71-30881# British Steel Corp., London (England). Metallurgy Dept.
INVESTIGATION OF SCATTER IN MEASUREMENTS OF OBSERVED VALUES OF RUPTURE DUCTILITY
1970 16 p
(PB-197140; MG/QD/178/69) Avail: NTIS CSCL 11F

The factors affecting scatter of the observed elongation values obtained from rupture tests on silicon killed, aluminum treated, carbon steel, were analyzed and recommendations made as to ways in which the scatter may be reduced. Author (GRA)

N71-30885# Royal Aircraft Establishment, Farnborough (England).
THE FATIGUE PROPERTIES OF TITANIUM AND TITANIUM ALLOYS, PART 5 [UEBER DAS DAUERSCHWINGVERHALTEN VON TITAN UND SEINEN LEGIERUNGEN. 5 TEIL]
M. Hemple Mar. 1971 39 p refs Transl. into ENGLISH from Draht (Coburg), v. 17, no. 11, 1966 p 819-829
(RAE-Lib-Trans-1534-pt-5) Avail: NTIS

The various types of presentation of fatigue strength diagrams are briefly presented and utilized to discuss the fatigue properties of notched and unnotched, flat and round test pieces of titanium and titanium alloys under varying degrees of pulsating tensile loading. The preparation sintered titanium alloys is then described and the fatigue and tensile properties of these materials are compared with those for conventionally produced alloys. It is shown that internal pores in the sintered material result in lower fatigue strength values than are found for conventionally produced materials. Finally, relationships between hardness values (Brinell, Rockwell and Vickers) and tensile strength are determined and it is shown that linear relationships exist between Brinell, Vickers and Rockwell C values and tensile strength but nonlinear relationships between Rockwell A and B values and tensile strength. Author

N71-30886# Royal Aircraft Establishment, Farnborough (England).
THE FATIGUE PROPERTIES OF TITANIUM AND TITANIUM ALLOYS. PART 3: THE EFFECT OF COLD WORKING AND HEAT TREATMENT ON THE FATIGUE STRENGTH [UEBER DAS DAUERSCHWINGVERHALTEN VON TITAN UND SEINEN LEGIERUNGEN. 3: EINFLUSS VON KALTVERFORMUNG UND WAERMEBEHANDLUNG AUF DIE WECHSELFESTIGKEIT]
M. Hempel Feb. 1971 41 p refs Transl. into ENGLISH from Draht (Coburg), v. 16, no. 10, 1965 p 716-726
(RAE-Lib-Trans-1519-Pt-3) Avail: NTIS

The effect of cold working and heat treatment on the tensile and the fatigue strengths of titanium and titanium alloys has been investigated. Increases in strength of sheets, bars and wires made from unalloyed titanium may be achieved by cold rolling or cold drawing. The percentage increase in strength depends on the initial strength of the titanium material and on the degree of cold working. With increases in the degree of working, in the case of unnotched test pieces, the tensile strength increases to a greater extent than the fatigue strength. The notch sensitivity also increases with an increase in the degree of working, while the notch effect factors are also increased with increasing stress concentration factors. Strengthening of unalloyed titanium by drawing or by twisting also strength of notched test pieces is displaced towards higher values with increasing degrees of working, and towards lower values with increasing stress concentration factors. A short account is given of the effect of the notch production method by grinding, turning, and pressing, as well as of the residual stresses, on the fatigue strength. An improvement in the strength properties of binary, ternary or complex titanium alloys may be obtained by suitable heat treatment. Author

N71-30892# British Steel Corp., London (England). Stripmills Div.
FOCUS ON ZINC COATINGS
K. G. Lewis 1970 6 p
(PB-197126; BISRA-SM/C/86) Avail: NTIS CSCL 11C

The following topics are presented: sheet galvanising; recent development in strip hot dip galvanising; painting of galvanised steel; uses of galvanised steel. GRA

N71-30907# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material- und Festkoerperforschung.
ROOM TEMPERATURE TENSILE PROPERTIES AND MICROSTRUCTURES OF STEEL X8CrNiMoVNb 1613 (4988), INCOLOY 800 AND INCONEL 718 AFTER AGEING AT 600 TO 800 C
W. E. Stumpf Nov. 1970 38 p refs
(EURFNR-875; KFK-1318) Avail: AEC Depository Libraries

The room temperature tensile properties of three alloys were correlated with the microstructural changes as observed by the electron microscope. Steel 4988 showed some hardening after prolonged aging at 600 C due to the precipitation of a very fine V(CN) phase. At higher temperatures this phase coarsened rapidly and no hardening was observed. Other carbides in this alloy did not contribute significantly to the mechanical properties except for M23C6 on grain boundaries, which was found only at 600 C and possibly contributed to the lower ductilities of this alloy after aging at 600 C. Similarly, Incoloy 800 was hardened by aging at 600 C, probably due to the formation of pre-precipitation zones of Ni3(TiAl). Inconel 718 was hardened by aging at 600 and 700 C due to the precipitation of a metastable bct-phase. The formation of NbC films on grain boundaries at 700 C can lead to very low ductilities. It is shown that upon overaging, the transformation from the metastable bct-gamma prime phase to the stable Ni3Nb phase occurred with the concomitant dissolution of these NbC films on the grain boundaries, causing an increase in the ductility once again. Author (NSA)

N71-30914# Royal Aircraft Establishment, Farnborough (England).
STUDY OF TRANSFORMATIONS IN T-A6V TITANIUM ALLOY UNDER CONTINUOUS COOLING [ETUDE DES TRANSFORMATIONS EN REFROIDISSEMENT CONTINU DE L'ALLIAGE DE TITANE T-A6V]
F. Le Maitre Dec. 1970 27 p refs Transl. into ENGLISH from Mem. Sci. Rev. Met. (France), v. 67, no. 9, 1970 p 563-574
(RAE-Lib-Trans-1548) Avail: NTIS

Dilatometric and thermal cooling tests carried out on T-A6V titanium alloy under various conditions of cooling are reported. Described are the alloy structures obtained for various test conditions and their complexity and phase transformations, both of which are dependent upon the rate of cooling. A proposed TTT diagram allows the kinetics of the various transformations to be stated accurately. Author

N71-31130*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALLOY FILM DEPOSITION Patent Application
John S. Przybyszewski, Jr. and Richard K. Shaltens, inventors (to NASA) 10 p Filed 14 Jan. 1971
(NASA-Case-LEW-10920-1; US-Patent-Appl-SN-106424) Avail: NTIS CSCL 11F

A method which combines ion plating with radio frequency sputtering is described for plating adherent alloy films on objects having complex geometries. A pulsed high voltage current is passed to the article being plated during radio frequency sputtering. NASA

N71-31131 Michigan Univ., Ann Arbor.
SOLUBILITY OF HYDROGEN IN LIQUID IRON-COBALT-NICKEL ALLOYS
Robert Gates Blossey (Ph.D. Thesis) 1969 105 p
Avail: Univ. Microfilms Order No. 70-14478

The solubility of hydrogen in liquid iron-cobalt-nickel alloys was determined by the Sieverts method for the entire metallic ternary. The change in hydrogen solubility with the addition of a fourth metallic component was determined at 1600 C for aluminum, copper, and manganese. The solubility of hydrogen at 1600 C and one atmosphere hydrogen pressure is 0.00264 weight per cent in iron, 0.00224 weight per cent in cobalt, and 0.00448 weight per cent in nickel. Hydrogen follows Sieverts' law for all alloy compositions. The free energy increment surface for hydrogen solution is planar for the entire iron-cobalt-nickel ternary. The enthalpy increment for hydrogen solution is 8.0 kcal/g atom H in iron, 8.5 kcal/g atom H in cobalt, and 5.2 kcal/g atom H nickel and is planar for the entire iron-cobalt-nickel ternary. The changes in hydrogen solubility evaluated as the Wagner interaction parameters which are constant for the entire iron-cobalt-nickel ternary are given. Dissert. Abstr.

N71-31135*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPECIFICATIONS FOR CLEANING, FUSION WELDING, AND POSTHEATING TANTALUM AND COLUMBIUM ALLOYS
T. J. Moore, P. E. Moorhead, and K. J. Bowles Jul. 1971 37 p refs
(NASA-TM-X-67879) Avail: NTIS CSCL 11F

Five specifications on the cleaning, fusion welding, and postheating of tantalum and niobium alloys. These specifications are intended for the use of NASA-Lewis and its contractors to help insure the production of defect free weldments. Author

N71-31139 Michigan Univ., Ann Arbor.
UNLOAD EMISSION BEHAVIOR OF MATERIALS AND ITS RELATION TO THE BAUSCHINGER EFFECT
Nott Gowri Sankar (Ph.D. Thesis) 1969 120 p
Avail: Univ. Microfilms Order No. 70-14631

Materials exhibit considerable acoustic emission when loaded in tension, and a correspondingly smaller amount of acoustic emission when a tensile load is removed. The unload emission behavior of certain materials with various heat treatments and the correlation exists between the Bauschinger effect and the acoustic emission during unloading. The materials tested were 99.99% aluminum, 6061 and 2024 aluminum alloys, copper-7.9% aluminum alloy, 70-30 brass and 99.95% magnesium. A piezoelectric transducer was used to detect the acoustic emission. When the applied stress was increased, the unload emission increased, reached a peak value and then decreased. Among the fcc materials tested, 99.99% aluminum showed the least unload emission and copper-7.9% aluminum alloy, the largest unload emission for the same plastic strain. A 99.95% magnesium showed even higher unload emission than a copper-7.9% aluminum alloy. Only coper-7.9% aluminum and 70-30 brass showed significant acoustic emission on repeated loading. Dissert. Abstr.

N71-31153*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SCANNING ELECTRON MICROSCOPE STUDY OF THE SURFACE MORPHOLOGY OF TD-NiCr OXIDIZED AT 800 C TO 1200 C
Carl E. Lowell 8 Jun. 1971 20 p refs
(NASA-TM-X-67867; E-6411) Avail: NTIS CSCL 11F

Scanning electron microscopy was used to study the surface of oxides formed on TD-NiCr at 800, 1000, and 1200 C for up to 64 hours. Abraded surfaces oxidized in air to form Cr_2O_3 which developed into large crystals suggesting vapor growth. Surfaces polished and oxidized had NiO on the surface except over grain boundaries and scratches which had Cr_2O_3 covering them. Wire samples of TD-NiCr were oxidized at 1200 C for up to 50 hours at pressures from 0.00001 to 700 torr. Large crystals of Cr_2O_3 resulting from vaporization and condensation were observed at pressures of 10 torr and above. Humid air oxidation altered oxide morphology markedly. Author

N71-31180*# Michigan Univ., Ann Arbor.
SENSITIVITY OF THE CREEP-RUPTURE PROPERTIES OF WASPALOY SHEET TO SHARP-EDGED NOTCHES IN THE TEMPERATURE RANGE OF 1000 TO 1400 F
David J. Wilson and James W. Freeman Washington NASA Jun. 1971 187 p refs
(Grant NGL-23-005-005)
(NASA-CR-1849; Rept-04368-17-T) Avail: NTIS CSCL 11F

Time dependent notch sensitivity was observed in Waspalloy sheet between 900 and 1300 F. It occurred in notched specimens loaded below their yield strength when tests of smooth specimens showed that small amounts of creep consumed large fractions of the creep-rupture life. Overaging eliminated the time-dependent notch sensitivity and produced a change in the dislocation mechanism from shearing to by-passing the gamma prime particles. Author

N71-31212# Council for Scientific and Industrial Research, Pretoria (South Africa).
ELECTRODEPOSITED METAL COATINGS IN THE ELECTRICAL INDUSTRY [GALVANISCHE METALLUEBERZUEGE IN DER ELEKTROINDUSTRIE]
Robert Weiner 1969 14 p refs Transl. into ENGLISH from Galvanotechnik (Saulgau/Wuerit.), v. 58, no. 8, 1967 p 570–576
Avail: NTIS

A state-of-the-art review is presented of electrodeposition processes with particular emphasis on their application in the field of electrotechnology and electronics. A discussion is given of the influence of metal coatings on various surface properties including: corrosion resistance against various chemical attacks, electrical conductive capacity, low and unvarying contact resistance, high wear resistance, solderability, and certain magnetic properties. In addition, the most widely used metals in electrodeposition processes are reviewed on an individual basis with brief analyses of their ability to produce the desired influences. D.L.G.

N71-31221*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF EXPERIMENTS AS MULTIPLY TELESCOPING SEQUENCES OF BLOCKS
Arthur G. Holms 1971 21 p refs Presented at 131st Ann. Meeting of the Am. Stat. Assoc., Fort Collins, Colo., 23–26 Aug. 1971
(NASA-TM-X-67882; E-6311) Avail: NTIS CSCL 11F

A blocked two-level factorial experiment was designed to measure the elevated-temperature time-dependent corrosion effects of liquid metal on immersed structural materials. Several types of block effects were postulated. The experiment was designed to be multiply telescoping so that orthogonal estimates of important parameters could be obtained in the presence of two or more types of block effects, even if the number of blocks introducing the several effects were not specified in advance. The rationale is given for selecting defining contrast and treatment generators to provide the options of multiple telescoping. The rationale is also given for identifying parameters aliased together and confounded with blocks. Author

N71-31244*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF EXPERIMENTS AS MULTIPLY TELESCOPING SEQUENCES OF BLOCKS WITH APPLICATION TO

CORROSION BY LIQUID METALS
Arthur G. Holms Washington Jul. 1971 26 p refs
(NASA-TN-D-6452; E-6311) Avail: NTIS CSCL 12A

A blocked two-level factorial experiment was designed to measure the elevated-temperature time-dependent corrosion effects of liquid metals on immersed structural materials. Several types of block effects were postulated. The experiment was designed to be multiply telescoping so that orthogonal estimates of important parameters could be obtained in the presence of two or more types of block effects, even if the number of blocks introducing the several effects were not specified in advance. The rationale is given for selecting defining contrast and treatment generators to provide the options of multiple telescoping. The rationale is also given for identifying parameters aliased together and confounded with blocks. Author

N71-31317# Technische Univ., Berlin (West Germany).
CONTRIBUTION TO CLARIFYING THE SOLUBILITY CONDITIONS FOR PHOSPHORUS IN IRON AND IRON ALLOYS BELOW 1000 C [BEITRAG ZUR KLAERUNG DER LOESLICHKEITSVERHAELTNISSE DES PHOSPHORS IN EISEN UND EISENLEGIERUNGEN UNTERHALB 1000 C]
Hans-Peter Hofmann (Ph.D. Thesis) 1969 86 p refs In GERMAN
Avail: NTIS

Solubility and diffusion conditions in the systems Fe-P, Fe-C-P, Fe-Si, and Fe-C-Si-P are studied with emphasis on phosphorus and carbon contents in the temperature range from 600 to 900 C. Distributive concentrations of the metals are determined by microstructure hardness, electron microscopy, and metallographic methods. Results show that phosphorus diffusion in alpha iron increases at 800 C and physical properties of the binary mixed crystal change if phosphorus concentration is more than 1.1%. Phosphorus solubility in Fe-Si and Fe-0.05% C-Si alloys decreases with increased silicon concentration. Carbon does not effect phosphorus solubility and decreases the effective diffusion coefficients in the alpha- and gamma-phase. Transl. by G.G.

N71-31319# Technische Univ., Berlin (West Germany).
THE CARBON-OXYGEN EQUILIBRIUM IN LIQUID NICKEL AND LIQUID NICKEL-COPPER ALLOYS [DAS KOHLENSTOFF-SAUERSTOFF-GLEICHGEWICHT IM FLUESSIGEN NICKEL UND IN FLUESSIGEN NICKELKUPFER-LEGIERUNGEN]
Klaus West Phal (Ph.D. Thesis) 1969 118 p refs In GERMAN
Avail: NTIS

Thermodynamic equilibria between carbon and oxygen for the system Ni-C-O were determined for various CO/CO2 gas mixtures at 1480 C, 1560 C, and 1640 C. Also observed were the effects of temperature variations and copper additions on carbon and oxygen activities in the Ni-C-O-Cu system. Results show the determining effects of temperature on all investigated processes. Additive copper alloying shifted carbon-oxygen equilibria at higher temperatures to higher values corresponding to the increased oxygen solubility. Transl. by G.G.

N71-31383# General Electric Co., Schenectady, N.Y. Research and Development Center.
TECHNOLOGY DEVELOPMENT FOR TRANSITION METAL-RARE EARTH HIGH-PERFORMANCE MAGNETIC MATERIALS Semiannual Interim Technical Report, 30 Jun.–31 Dec. 1970
Joseph J. Becker Apr. 1971 46 p refs
(Contract F33615-70-C-1626; ARPA Order 1617)
(AD-722772; S-71-1047; AFML-TR-71-31; SATR-1) Avail: NTIS CSCL 11/6

Magnetization reversal discontinuities were studied in samples consisting of a few particles or a single particle. Experiments with successive polishing treatments indicate that individual defects are responsible for the observed magnetization behavior. A particle of Co5Y showed a perfectly rectangular hysteresis loop and a maximum energy product of 27.6mGO3. It has been found possible to analyze complex single-particle loops into linear combinations of elementary loops, as though the particles consisted of independent sub-particles. Metallographic studies of as-cast and annealed alloys of various compositions indicated that annealing has little effect on the observed phase distribution. Polarized light studies of finished magnets showed a greater tendency toward multidomain structures in magnets with lesser properties. A technique for analyzing the rare earth present in a compound in the reduced state indicated that this may be substantially less than the total rare earth present. Studies of Co-Nd-Sm and Co-Pr-Nd-Sm, aimed toward energy products of 25 mGOe or more, indicate that Nd and Pr combined are more effective than Nd alone in increasing the saturation, and that the variation of properties in these alloys is quite different from what it is in the Co-Pr-Sm alloys. An energy product of 20 mGOe has been attained in a Co-Pr-Nd-Sm alloy, although the optimum composition has not yet been reached. Author (GRA)

N71-31364*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
COMBINED ELECTRON MICROSCOPE, ELECTRON DIFFRACTION, AND ELECTRON MICROPROBE ANALYSIS IDENTICAL MICROSTRUCTURES IN THE DEBOND AREA OF A DISSIMILAR METAL JOINT
L. G. Bostwick and R. Burton Washington Aug. 1971 21 p refs
(NASA-TN-D-6327) Avail: NTIS CSCL 11F

The examination of a defective solid state weldment on a liquid hydrogen tank from the Apollo 12 fuel cell system was undertaken to supplement results of an earlier malfunction investigation. Correlation of data accumulated on identical microstructures by electron microscopy, electron diffraction, and electron microprobe analysis resulted in the identification of numerous anomalous constituents in the weld interface zone, thereby demonstrating the feasibility of applying this unique combination of techniques to the identification of unknown particulates. Author

N71-31396# California Univ., Berkeley. Lawrence Radiation Lab.
MECHANICAL PROPERTIES OF LAVES PHASES
Go Sasaki (M.S. Thesis) Dec. 1970 69 p refs
(Contract W-7405-eng-48)
(UCRL-20301) Avail: NTIS

Primary interest in Laves phases in iron binary systems with transition elements lies in their effects as dispersed precipitates. Mechanical properties of Laves phases, NbFe2, TaFe2, TiFe2, ZrFe2, and HfFe2 were studied by use of a micro Vickers hardness tester. The highest strength (over Hv. 1000) was obtained in NbFe2 and TaFe2, while the strength of TiFe2 and ZrFe2 was comparatively low (Hv. 859). The observation of the deformation around the hardness indentation showed that TaFe2, ZrFe2, and HfFe2 seemed to deform partially with plastic form. NbFe2, and TaFe2, which had almost the same strength but deformed differently were chosen for the study of their effects on the mechanical properties of the iron base binary alloys. Both higher strength and better ductility were obtained in the Fe–1.9 at.% Ta alloy than in Fe–1.78 at.% Nb alloy. A remarkable denuded zone at the retained delta grain boundaries was observed in the Fe–1.78 at.% Nb alloy. Author (NSA)

N71-31397# Birmingham Univ. (England). Dept. of Physical Metallurgy and Science of Materials.
THERMODYNAMICS OF ALLOYS Final Technical Report, Jan.–Dec. 1970
John N. Pratt, A. W. Bryant, and D. T. Underhill Jan. 1971 31 p refs
(Contract DAJA37-70-C-0832)

(AD-722799; ARDG(E)-E-1385) Avail: NTIS CSCL 11/6

Tin solution calorimetry has been used to measure the heats of formation of selected face-centered cubic palladium-rich solid solutions of the palladium-silver-tin system. The results show that alloys of constant electron concentration are characterised by heats of formation which vary almost exactly linearly between the values for the terminal binary alloys. The results are discussed in relation to the possible contributions associated with electronic energy and ion-ion interaction effects. Lattice parameters of the alloys have been measured and a linear variation of these is also observed. The technique based on the precipitation of an alloy phase from liquid tin has been used for the study of the aluminides Pt2Al3(Ni2Al3-type), RhAl (CsCl-type) and NiAl (CsCl-type), while normal solution calorimetry has been used to investigate the compound PdGa (FeSi-type). Values obtained for the heats of formation were found. These and previously determined heats of formation of related compounds are compared and trends and influences in the heats of formation of transition metal aluminides and palladium - Group IIIB compounds are discussed. Author (GRA)

N71-31402# Sandia Corp., Albuquerque, N.Mex.
REACTION OF MULBERRY WITH VARIOUS GASES
R. A. Sallach Feb. 1971 20 p refs Sponsored by AEC
(SC-DR-710124) Avail: NTIS

The reaction of Mulberry alloy with the gases CO2, H2O, N2, and O2 was surveyed. With CO2 a linear reaction was found at 600 C. With other gases, parabolic reactions were generally found; deviations were attributed to spalling of reaction product. Catastrophic reactions with H2O and O2 were observed at 600 C. The reactivity of the gases can be ordered as O2 approximately same as H2O > N2 > or = CO2. Author (NSA)

N71-31422# Battelle Memorial Inst., Columbus, Ohio.
EXPERIMENTS TO TEST A SYSTEMS ANALYSIS OF BRITTLE FRACTURE Final Technical Report, 1 May 1968–31 Dec. 1970
G. T. Hahn, R. G. Hoagland, M. F. Kanninen, and A. R. Rosenfield 1971 8 p refs
(Grant DA-ARO(D)-31-124-G1095)
(AD-722876; AROD-5668-7-MC) Avail: NTIS CSCL 11/6

The aim of this program has been to simplify the complex problem of fracture of metals by a systems approach: for a given type or mode of failure, the basic simple parameters and mechanisms controlling failure are identified, these are treated individually by experiment and analysis, and the individual results are combined into a description of the failure process yielding predictions which can be checked by experiment. Except for the last portion of the program, the experiments were conducted on center cracked steel foils. In the earlier stages of work the analysis concentrated on predictions of the development of plasticity with loading and the conditions at which crack propagation begins. The work was then directed toward the problem of rapid crack propagation basing the analysis on previous results. The work has yielded a detailed description of crack propagation under plane stress conditions both in the form of an analytic model and experimental observations of crack speeds. A method for quantitatively measuring the energy absorption rate of a material during crack propagation has been tested. This method holds promise as a way of characterizing the intrinsic resistance to unstable crack propagation. Some of the concepts and methods developed have been applied to the very complex problem of calculating crack speeds in pipelines. Author (GRA)

N71-31559# Lehigh Univ., Bethlehem, Pa.
HYDROSTATIC EXTRUSION OF HARD CORE CLAD ROD
William Zoerner (M.S. Thesis) 1971 37 p refs Sponsored by AEC and NDEA
(NYO-4078-3) Avail: NTIS

An experimental study was conducted to determine the influence that core to sleeve bonding had on fracture of hydrostatically extruded hard core clad rod. This study was extended to show the sound flow and defective flow zones which are represented by areas within a graphical plot of extrusion die semicone angle versus percent reduction in area per pass for a specific set of geometries and strength ratios with varying bond strengths. Variables affecting defects formed during the hydrostatic extrusion of hard core clad rod are reduction in area, die to billet friction, semicone angle of the die, core to sleeve diameter ratio, core to sleeve strength ratio, prescribed body tractions, and the bond between the core and sleeve. Experimental results show that some degree of bonding is necessary for a defect free extrusion of clad rod and that the strength of the bond dictates to a certain degree the type of defect. Results also show that the stronger the core to sleeve bond, the larger is the area zone of a defect free product drawn on a graph with axis of die cone angle and percent reduction in area. Effects due to increased strength ratio values for a given bond strength were also presented. Author

N71-31561# Battelle Memorial Inst., Columbus, Ohio.
EFFECTS OF HYDRIDE PRECIPITATION ON THE TENSILE PROPERTIES OF IRRADIATED ZIRCALOY-2 Final Report
Mihkel Kangilaski, James S. Perrin, and Richard A. Wullaert Mar. 1970 25 p refs Sponsored in part by AEC Prepared for Bettis Atomic Power Lab., Pittsburgh, Pa.
(Contract NObs-94029)
(BMI-X-10276) Avail: NTIS

Metallographic examination of a tapered tensile specimen, whose gage section had been subjected to tensile stresses ranging from 5000 to 30,000 psi during cooling from 680 F, indicated that a stress of at least 30,000 psi was necessary to orient hydride platelets perpendicular to the stress axis in irradiated Zircaloy-2. The effect of 170 ppm of hydrogen on the tensile properties of Zircaloy-2 specimens irradiated to a fast fluence of 5 × 10 to the 21st power nvt was also determined. The unoriented zirconium hydride platelets caused a minor reduction in strength of the unnotched Zircaloy-2 specimens at room temperature and reduced the values of reduction in area at 500 F. The orientation of zirconium hydride platelets perpendicular to the tensile axis did not significantly influence the tensile strength of unnotched samples, but decreased the reduction in area of irradiated Zircaloy-2 at both room temperature and 500 F. The notch strength ratio of irradiated Zircaloy-2 was not significantly influenced by additions of hydrogen and stress orientation of the zirconium hydride platelets. Author (NSA)

N71-31574# Oak Ridge National Lab., Tenn.
MANUAL FOR ASTM A-533 GRADE B, CLASS 1 STEEL (HSST PLATE 03) PROVIDED TO THE INTERNATIONAL ATOMIC ENERGY AGENCY
C. E. Childress Mar. 1971 58 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3193) Avail: NTIS

On completion of fabrication, heat treatment, and testing at the mill, plate 03 was cut into smaller subdivisions called plate sections. Appropriately sized plate sections, depending on the types of tests to be performed, were assigned to research facilities, universities, testing agencies. Practically all of the material assigned to date was from the plate periphery. Most of the remaining plate material is designated as International Atomic Energy Agency (IAEA) material. The fabrication history of plate 03, along with most of the technical data derived from tests involving peripheral material, is presented. Author (NSA)

N71-31575# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
TWO CURRENTS CONDUCTION IN KONDO ALLOYS
Ryusuke Hasegawa Apr. 1971 7 p refs

(Contract AT(04-3)-822)
(CALT-822-28; Rept-23) Avail: NTIS

Assuming that the conductivities for the electrons with spin-up and spin-down are different, higher order correction terms to the lnT dependence of the resistivity in Kondo alloys are obtained. The present analysis shows that the conductivities for the two kinds of electrons indeed differ when J sub sd is large and tend to become identical as J sub sd goes to zero. These results seem to be consistent with Friedel's virtual bound state model. Author

N71-31576# WADCO Corp., Richland, Wash. Hanford Engineering Development Lab.
EFFECTS OF NEUTRON IRRADIATION, AT THERMAL REACTOR TEMPERATURES, ON THE PROPAGATION VELOCITY OF ULTRASONIC WAVES IN A533-B STEEL
D. O. Hunter Dec. 1970 23 p refs
(Contract AT(45-1)-2170)
(WHAN-FR-38) Avail: NTIS

Ultrasonic measurements at 4 MHz and 10 MHz were made on some A533-B tensile and fracture specimens both before and after irradiation from 1 to 9 × 10 to the 19th power nvt (E is greater than 1 MeV), and at irradiation temperatures of 503 to 550 F. Velocity changes were less than + or − 0.15%; attenuation changes were small and caused in part by degraded surface smoothness. Due to the fact that ultrasonic changes are very small, do not predictably relate to neutron fluence, and do not correlate with mechanical changes, the method does not appear feasible for assessment of irradiation damage in steel irradiated at thermal reactor temperatures. These findings contrast to those of earlier work which showed readily measurable elasticity changes in steels irradiated at temperatures below 300 to 350 F, and apparent large elasticity changes in stainless steels irradiated to high fluences at 700 to 1400 F. Author (NSA)

N71-31684# George Washington Univ., Washington, D.C. Inst. For the Study of Fatigue Fracture and Structural Reliability.
FATIGUE MECHANISM IN TITANIUM AT ULTRASONIC FREQUENCY
D. E. McDonald and W. A. Wood May 1971 19 p refs
(Contract N00014-67-A-0214-011)
(AD-723533; TR-8) Avail: NTIS CSCL 11/6

The fatigue mechanism in titanium was studied metallographically for small strain amplitudes (approximately 0.003) at the normal engineering test frequency of 1700 cpm and at the ultrasonic frequency of 16000 Hz. It is found that the ultrasonic frequencies develop localized strains at solitary slip bands on the order of the theoretical strength of the material (approximately 0.1G). These solitary slip bands develop into micro-cracks which are the source of fatigue initiation at the ultrasonic frequency. The low frequency fatigue in contrast develops from apparently slipless transgranular shear microcracks. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N71-30582# Bendix Corp., Kansas City, Mo.
CARBON/CARBON HONEYCOMB
W. C. Rutherford May 1970 33 p
(Contract AT(29-1)-613)
(BDX-613-335) Avail: NTIS

The feasibility was established of fabricating carbon/carbon honeycomb using woven carbon cloth. Initial trials with carbon paper were not successful. A new cell configuration was developed to allow forming the honeycomb to curved surfaces and it does not require that the cell wall material withstand plasting. The impregnation resin was mixed to provide flexibility and hi-char characteristics. Author

N71-30614# Danish Research Centre for Applied Electronics, Copenhagen.
CUSHION MATERIALS FOR PACKAGING: TRANSPORT PROTECTION PROPERTIES UNDER DIFFERENT CLIMATIC CONDITIONS [POLSTRINGSMATERIALER TIL EMBALLAGE: TRANSPORTBESKYTTENDE EGENSKABER UNDER FORSKELLIGE KLIMATISKE FORHOLD]
B. E. Bang Sep. 1969 79 p refs In DANISH; ENGLISH summary
(ECR-09) Avail: NTIS

The dynamic properties of cushion materials for packaging were studied by combined drop (shock) and climatic tests, and combined vibration and climatic tests. The materials tested were: corrugated cardboard, sponge rubber, latex-bonded coco, Ethafoam, Styropor, Polyurethan, Moltex, and plastic balls. Data were obtained using accelerometers attached to dummies cushioned on six sides by a given material. The drop tests were simulated on a shock test machine, and the vibration tests were made with an electrodynamic vibrator. Temperatures of −40, − 10, +2, and 70 C were obtained by air injection. ESRO

N71-30722*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT THERMAL PERFORMANCE OF MULTILAYER INSULATION SYSTEMS DURING SIMULATED ASCENT PRESSURE DECAY
Irving E. Sumner and Joseph E. Maloy Washington Jul. 1971 78 p refs
(NASA-TN-D-6335; E-5764) Avail: NTIS CSCL 11D

Thermal tests were conducted to determine experimentally the transient heat flux and total integrated heat transferred to a liquid hydrogen tank during a simulated Saturn 5 ascent pressure decay. Three 30-layer helium-purged multilayer insulations systems were tested, comprised of: (1) glass-fiber paper or silk netting spacers between aluminized Mylar radiation shields and (2) fiber glass mat or sealed foam sublayers. All three insulation systems achieved space-hold heat-transfer conditions within 2 hours after initiation of pumpdown. The integrated heat transferred was approximately 25 percent greater than ideal, except for the system utilizing the foam sublayer which had not been optimized with regard to thickness. Author

N71-30805# National Cash Register Co., Dayton, Ohio. Capsular Research and Product Development Dept.
MICROENCAPSULATED CLOUD SEEDING MATERIALS Final Report, 15 Aug. 1969 - 14 Jan. 1971
Jerrold L. Anderson Feb. 1971 159 p ref
(Contract F19628-70-C-0011)
(AD-722448; AFCRL-71-0151) Avail: NTIS CSCL 11/3

A process was developed for encapsulating hygroscopic, cloud-seeding agents, sodium chloride and urea. The encapsulation process involves depositing the coating polymer, ethylcellulose, onto finely divided powders using a phase separation-coacervation technique. The process produces small encapsulated aggregates, the size and distribution of which can be varied. Encapsulated materials prepared by the process are unique in that they are void, essentially, of powder fines. Laboratory tests of both encapsulated sodium chloride and urea proved the powders to be resistant to clumping and caking associated with premature moisture sorption occurring during storage and handling. The encapsulation coating

polymer, ethylcellulose, is water insoluble, but is permeable to water vapor, water and solutes. Hence, water sorption and particle growth properties resulting from exposure of the encapsulated particles to humid atmospheres are effected by diffusion-mass transport processes. Laboratory testing of encapsulated sodium chloride and urea materials in simulated warm fog atmospheres revealed water sorption characteristics which were comparable to unencapsulated particles having equivalent dimension. Author (GRA)

N71-30895# Defense Documentation Center, Alexandria, Va.
PLASTICS IN COMPOSITE MATERIALS, VOLUME 1 Bibliography Report, Jan. 1964 – Aug. 1970
Apr. 1971 233 p refs
(AD-722940; DDC-TAS-71-7-1-Vol-1) Avail: NTIS CSCL 11/4

The bibliography contains annotated references on plastics in composite materials. Some of the topics are: Testing techniques for filament reinforced plastics, stresses from strains on woven-roving fiberglass-reinforced plastics, an investigation of the fatigue and creep properties of glass reinforced plastics for primary aircraft structures, relation between the tensile modulus and the failure time of glass-filled nylons, graphite fiber reinforced composites, research on improved epoxy resins, and application of directed glass fiber reinforced plastic to helicopter tail rotor assembly. Author (GRA)

N71-30899# Center for Fire Safety, Delft (Netherlands).
INFORMATIVE TESTING ON GLASS FIBRE REINFORCED POLYESTER [ORIEENTERENDE PROEVEN GLASVEZELGEWAPEND POLYESTER]
J. F. van Elteren 22 Dec. 1970 8 p In DUTCH
(TDCK-57264; Rept-70-BV-3454) Avail: NTIS

Flame retardation and fire combustion behavior of glass fiber reinforced polyester panels were investigated by exposure to a normal heating curve. The plate materials contained either 600 g/sqm glass, or 450 g/sqm glass at thicknesses of 7.5 mm or 9.5 mm, respectively. Results found no substantial effects of temperature increases on panel sides facing the heat. Transl. by G.G.

N71-31140*# Accessory Products Co., Whittier, Calif.
RUBBER COMPOSITION FOR USE WITH HYDRAZINE Patent Application
John Repar, inventor (to NASA) 13 p Filed 29 Jan. 1971 Prepared for JPL
(Contracts NAS7-100; JPL-951939)
(NASA-Case-NPO-11433; US-Patent-Appl-SN-111123) Avail: NTIS CSCL 11D

A rubber composition useful for expulsion bladders and diaphragms in systems containing hydrazine is discussed. The system is composed of an ethylene propylene terpolymer, silica reinforcing filler, zinc oxide and sufficient sulfur compounds to effect vulcanization of the terpolymer. NASA

N71-31224 Utah Univ., Salt Lake City.
EPR AND FRACTURE MECHANICS APPLIED TO OZONE CRACKING IN RUBBER
Eric Roger Simonson (Ph.D. Thesis) 1970 129 p
Avail: Univ. Microfilms Order No. 70-14449

The degree of degradation of gum rubber compounds was found to be approximately proportional to the ozone concentration. It was also found by using electron paramagnetic techniques (EPR) that the number of polymer chains in acrylonitrile-butadiene cleaved by ozone was linearly proportional to strain and time with an apparent threshold strain, where below that point (usually 5% to 11% strain) no increase in chain rupture was observed. The number of ozone cracks per unit surface area was found to be greater at higher strains and was attributed to an increasing number of crack nucleation sites. Correspondingly, at high crack densities the time to failure (zero load) at constant elongation was observed to be longer than at low crack densities. The longer time to failure was attributed to mutual interference of the cracks which inhibited the over-all crack growth rate. Carbon black filled rubbers were also found to exhibit these results except no quantitative EPR results were obtained because the large amount of carbon filler obscured any signal produced from chain scission. Dissert. Abstr.

N71-31226 Washington State Univ., Pullman.
COMPOSITE ORGANIC SEMICONDUCTORS FROM PYROLYZED ION EXCHANGE RESINS
Roger Curtis Brown (Ph.D. Thesis) 1970 214 p
Avail: Univ. Microfilms Order No. 70-16799

The goal of this investigation was to find methods of formulating composite organic materials having semiconductor properties and to investigate the applicability of present day theory of the solid state to these materials. The composite material selected for intensive study was formed into plastic disks to which electrodes were applied. The disks were composed of pyrolyzed ion exchange resin in a matrix of epoxy molding powder. Dowex 50 ion exchange resin, in which H, Na, Mg, Ni, Al, Fe, and Th ions had been incorporated, was used. The resin samples loaded with the above cations were pyrolyzed in vacuum at temperatures from 500-750 C. Electrical measurements were made on the disks to determine conductivity as a function of temperature, energy gap, mobility, Seebeck coefficients, and trap energies. Dissert. Abstr.

N71-31250 Rutgers Univ., New Brunswick, N.Y.
STRUCTURES AND PROPERTIES OF La2O3-BaO-B2O3 GLASSES
Joseph William Malmendier (Ph.D. Thesis) 1970 308 p
Avail: Univ. Microfilms Order No. 70-16939

Melts were made of three compositions near the apices of the approximately triangular glass forming region in the La2O3-BaO-B2O3 system. These were chemically analyzed and experimental melts were prepared from mixtures of these three protogenic melts. Differential thermal and thermogravimetric analyses were used to determine optimum melting conditions. A special technique was developed to achieve homogeneous glasses. Similar thermal histories were established for all glasses by one thermal treatment. Density, refractive index, thermal expansion, dielectric constant, and power factor were determined for each composition. The manner in which these properties varied with composition was related to the structure of the glasses in the system. X-ray diffraction measurements were made of devitrified and vitreous compositions. The coordination structure of lanthanum in La2O3-B2O3 glasses was determined. Electron microscopy was employed to determine the presence and extent of subsolidus phase separation. Dissert. Abstr.

N71-31252 Arkansas Univ., Fayetteville.
EFFECT OF PARTICLE SPATIAL DISTRIBUTION ON THERMAL CONDUCTIVITY OF TWO-PHASE SYSTEMS
Pradeep Bapusaheb Deshpande (Ph.D. Thesis) 1970 146 p
Avail: Univ. Microfilms Order No. 70-17185

The effect of particle spatial distribution on the thermal conductivity of solid-liquid two-phase systems is discussed. The basic model employed was the beta distribution model with two parameters. One-dimensional porosity data for two different sized glass particles were obtained. Since one-dimensional porosity data for different sized particles were available, the effect of particle size on the two-phase thermal conductivity could be studied. Several methods were developed in this investigation for evaluating the two-dimensional porosity, P2, and P1 for the beta distribution model. Author

N71-31264 Rutgers Univ., New Brunswick, N.J.
REACTIONS BETWEEN ALKALI-LEAD OXIDE-SILICA GLASSES AND ACID SOLUTION

John Stanley Wasylyk (Ph.D. Thesis) 1970 207 p
Avail: Univ. Microfilms Order No. 70-16957

The behavior of four lead containing silicate glasses was studied in an acetic acid solution. A testing apparatus was devised which permitted the acid attack process to be followed as functions of time and acid temperature. The amounts of alkali and lead leached from the glasses was determined quantitatively. The experimental results indicated that two distinct modes of attack governed the durability behavior of the glasses. Complete dissolution was found to occur at low acid temperatures. Soluble components leached from the glasses followed a linear time relation. As the acid temperature increased, the durability of the glass increased. The explanation advanced was that a silica film formed at the glass-acid interface, the formation of which increased with time and temperature. The film acted as a hindrance to further attack of the glass. The leaching rates of the soluble components of the glass reflect diffusion through such a layer. Optical examination of the layers formed showed them to be similar to fused silica.
Dissert. Abstr.

N71-31277 Rutgers Univ., New Brunswick, N.J.
PROPERTIES AND STRUCTURE OF La2O3-CdO-B2O3 GLASSES
Charles William Deneka (Ph.D. Thesis) 1970 252 p
Avail: Univ. Microfilms Order No. 70-16927

Experimental compositions were prepared from analyzed frit with additions of La2O3, CdO and H3BO3 in some cases. A special technique was used to obtain homogeneous glasses which were then given equivalent heat treatments. Several physical properties were measured from which structural inferences were drawn. Density, index of refraction, and indentation hardness were determined at room temperature while coefficients of linear thermal expansion were determined from room temperature to 300 C. Glass transition temperatures were determined from thermal expansion curves. Dielectric constant and dielectric dissipation factor were determined over a frequency range of 50 KHz to 50 MHz.
Dissert. Abstr.

N71-31280 Maryland Univ., College Park.
LUMINESCENCE OF URANIUM GLASSES
Alfred Guion Eubanks (Ph.D. Thesis) 1969 101 p
Avail: Univ. Microfilms Order No. 70-15500

A series of uranium glasses was developed which have cathodoluminescent and photoluminescent efficiencies superior to those of any glasses previously reported. The most efficient glass is of composition 29.40 wt% B2O3, 58.80 wt% SiO2, 9.80 wt% Na2O and 2.00 wt% UO2. It has an intrinsic cathodoluminescent efficiency of (1.1 + or − 0.1)% and a photoluminescent radiant efficiency of (12 + or − 1)%. The absolute radiant emittance spectra of the glasses were determined during excitation with 100 keV to 350 keV electrons and with 253.7 nm light. The glasses luminesce over the wavelength range 470 nm to 630 nm with three maxima which occur at 518, 534, and 563 nm. The measured absolute cathodoluminescent spectral radiant emittances, calculated electron depth-dose distributions and the Kubelka-Munk theory of light scattering and absorption in a powder were used to calculate the intrinsic cathodoluminescent efficiencies of the glasses.
Dissert. Abstr.

N71-31327# Technische Univ., Berlin (West Germany).
PREPARATORY AND SPECTROSCOPIC STUDIES ON SOME NONMETALLIC SUBCOMPOUNDS [PRAEPARATIVE UND SPEKTROSKOPISCHE UNTERSUCHUNGEN AN EINIGEN SUBVERBINDUNGEN DER NICHTMETALLE]
Ralf Steudel (Ph.D. Thesis) 1969 117 p refs In GERMAN
Avail: NTIS

Unstable and dissociative gaseous compounds were quickly frozen and spectroscopically analyzed at cryogenic temperatures for primary products. Reaction mechanisms were determined for: (1) thermal dissociation of S2O and the structure of developing SnOm compounds (n greater than m); (2) sulfanoxides of the type X-S-SO-S-...S-SO-X with X = HS, Cl, Br; (3) a bis-organyl-sulfenoxide with more than two S atoms; (4) an organyl-halogen-sulfenoxide with more than one S atom; (5) a soluble sulfur suboxide SnOm; (6) S8, S8, S12 in mixed compounds; (7) isolation of CS in CS2-matrix; (8) isolation of CSe in plasmalysis of CSe2; (9) isolation of CCl3 in CCl4-matrix; (10) and identification of CCl3 as intermediate reaction product in various dissociative reactions.
Transl. by G.G.

N71-31341*# Southern Research Inst., Birmingham, Ala.
PROPERTIES OF ABLATION AND INSULATION MATERIALS. VOLUME 2: THERMAL PROPERTIES OF THREE RIGIDIZED FIBROUS INSULATORS
E. D. Smyly and C. D. Pears Jun. 1971 136 p refs
(Contract NAS1-7732-1)
(NASA-CR-111917) Avail: NTIS CSCL 11D

Thermal conductivity, thermal expansion and heat capacity were determined on three rigidized fibrous insulators. The materials consisted of either silica or similar type fibers rigidized with a binder. Properties were measured from 150 K to either 1900 K or the temperature at which severe shrinkage began. Thermal conductivity measurements were made in vacuum, air, and nitrogen. For Volumes 1 and 3, see N71-27746 and N71-27636.
Author

N71-31404*# Translation Consultants, Ltd., Arlington, Va.
COMPOSITION OF TRACE MINERAL INCLUSIONS IN CASSITERITE FROM DATA FROM POINT X-RAY SPECTRAL ANALYSIS [SOSTAV MIKROMINERALOV, VKLYUCHENNYKH V KASSITERITE, PO DANNYM TOCHECHNOGO RENTGENOSPEKTRALNOGO ANALIZA]
Ye. I. Dolomanova et al Washington NASA Aug. 1971 13 p refs Transl. into ENGLISH from Zap. Vses. Mineralog. Obshchestva (Moscow), no. 95, Issue 2, 1966 p 214–221
(Contract NASw-2038)
(NASA-TT-F-13760) Avail: NTIS CSCL 11D

The use of point X-ray spectral microscopic analysis to study the composition of the trace-mineral impurities contained in cassiterite from the Etyka tin ore deposit is described. The results of chemical and qualitative X-ray analysis, as well as of microanalysis, are described.
Author

N71-31405# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME STUDIES OF NEW MATERIALS BASED ON SILVER AND SYNTHETIC MICA
V. F. Afanasyev et al 29 Jan. 1971 12 p refs Transl. into ENGLISH from Fiz.-Khim. Mekhan. Materialov, Akad. Nauk Ukr. SSR (Kiev), v. 5, no. 6, 1970 p 680–682
(AD-722819; FTD-HT-23-877-70) Avail: NTIS CSCL 11/8

Technology has been developed for preparing new composite materials based on silver and synthetic mica. An experimental investigation of the physicomechanical properties and antifriction characteristics of these materials during friction without lubrication was carried out. With an increase in the mica content in the material, volume weight and volume shrinkage are reduced, the strength characteristics of the material are impaired, and electrical resistivity is increased. The introduction of the optimum quantity of mica (5-15 percent) facilitates a reduction in the friction coefficient and an increase in the load-carrying capacity of the material.
Author (GRA)

N71-31466# Technische Univ., Berlin (West Germany).
STATIONARY AND SLOWLY MOVING HIGH FIELD REGIONS IN CADMIUM SULFIDE [STATIONAERE UND LANGSAM WANDERNDE HOCHFELDDOMAENEN IN KADMIUMSULFID]

Peter Voss (Ph.D. Thesis) 1969 133 p refs In GERMAN
Avail: NTIS

Application of a high electric potentials on silver- or gold-doped cadmium crystals produces stationary and slowly moving field inhomogeneities. Relative sharply defined regions of high and low electrical fields with boundaries vertical to the lines of current are formed. A stationary high field distribution usually adhers to the electrode whereas isolated high frequency regions move through the material without changing. Periodic formations and dissolutions of moving regions are attributed to negative differential volume conductivities; these are caused by recombination and concentration reactions of majority carriers, charge carrier distributions in bands of differing mobility, and drift accumulation of majority carriers. Experiments show that stable moving high field regions develop in silver doped cadmium crystals from unstable regions, and that a direct change from a homogeneous field distribution to a stable region takes place in copper-doped cadmium. It is also shown that the barrier effect in the gold-doped cadmium sulfide crystal depends on current density. Transl. by G.G.

N71-31592# United Aircraft Corp., East Hartford, Conn.
EFFECT OF EUTECTIC MICROSTRUCTURE ON THE PROPERTIES OF CERAMIC OXIDES Technical Report, 1 Feb. 1970 - 31 Jan. 1971
Charles O. Hulse and John A. Batt 14 May 1971 31 p refs
(Contract N00014-69-C-0073)
(AD-723818; UARL-K910803-5; TR-2) Avail: NTIS CSCL 11/2

Continued development of equipment and techniques to produce well-controlled, directionally solidified oxide eutectic ingots was undertaken. With eutectics exhibiting melting temperatures below approximately 1550C, bottom cooling of contained melts generally resulted in poorly controlled eutectic micro-structures due to the low liquid-solid thermal gradients caused by the thermal insulation of the growing ingot. Various floating-zone, directional solidification approaches were successfully developed which used resistance heaters surrounding and/or in direct contact with the molten ceramic. At eutectic temperatures above approximately 1700C, apparent metal pick-up from the heaters was observed and radiant heating by refractory metal wires was found to be the best approach. The present emphasis is directed toward the growth of high temperature structural materials. Towards this end, a number of ingots of the Al2O3-ZrO2 eutectic containing Y2O3 as a stabilizer have been directionally solidified by the radiatively melted, floating-zone technique. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N71-30471# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
CALCULATION OF SUPERPROPAGATORS IN NONLINEAR QUANTUM FIELD THEORIES
N. M. Atakishiev and A. T. Filippov 1971 18 p refs In RUSSIAN
(JINR-P2-5657) Avail: AEC Depository Libraries

A new method of constructing the superpropagators in nonlinear quantum field theories is suggested. The method makes it possible to derive explicit analytic expressions for the superpropagators for a wide class of field theories - from strictly local up to essentially nonlocal. The essence of the method is the construction of a differential equation for the superpropagator which in general is of an infinite order. By use of the boundary condition at p squared = 0 the solution of this equation is found depending on one arbitrary real parameter. Simple examples are given to illustrate the method. Author (NSA)

N71-30480# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Atomnoi Energii.
STATEMENT OF A PROBLEM FOR EIGENVALUES FOR A GROUP OF PERMUTATIONS
Yu. V. Gaponov 1970 10 p refs In RUSSIAN
(IAE-1988) Avail: AEC Depository Libraries

It is suggested that an additional group of operators constructed for a group of permutations S sub N be included in the full set of commutating operators of system N to describe the permutational symmetry properties of the system. The corresponding sets are studied for systems of identical and nonidentical particles. NSA

N71-30505# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ASYMPTOTICAL RELATIONS FOR THE AVERAGED AMPLITUDE WITH THE MOST GENERAL UNDERSTANDING OF MICROCAUSALITY AND WITH ITS VIOLATION
Yu. M. Lomsadze, E. P. Sebad, and A. E. Rovt 1970 18 p refs
(ITF-70-80-E) Avail: AEC Depository Libraries

It is shown that if the averaged asymptotical amplitude exists at least for one averaging function then it, by reason of the generalized microcausality principle, is a boundary value of the function satisfying all the conditions of the generalized maximum principle of Phragmen - Lindelof - Nevanlinna in the closed upper complex halfplane and, consequently, as asymptotical relations and the asymptotical equalities must hold true for it under the corresponding conditions on the omega prime axis. Also the generalizations of some of the asymptotical equalities with the violation of microcausality were obtained by means of introducing the elementary length. Author (NSA)

N71-30519# National Physical Lab., Teddington (England). Div. of Numerical and Applied Mathematics.
QUASI-NEWTON METHODS FOR UNCONSTRAINED OPTIMIZATION
P. E. Gill and W. Murray Apr. 1971 33 p refs
(NPL-Ma-97) Copyright. Avail: NTIS

A revised algorithm is given for unconstrained optimization using quasi-Newton methods. The method is based on recurring the factorization of an approximation to the Hessian matrix. Knowledge of this factorization allows greater flexibility when choosing the direction of search while minimizing the adverse effects of rounding error. The improved control over rounding error enables the algorithm to be used when analytical derivatives are unavailable. Author (ESRO)

N71-30554# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).
STUDY OF CELLULAR NETWORKS USING BIVALENT LINEAR PROGRAMMING [ETUDE DE RESEAUX CELLULAIRES A L'AIDE DE LA PROGRAMMATION LINEAIRE BIVALENTE]
J. E. Doucet Mar. 1971 21 p refs In FRENCH
(LAAS-STI-770) Avail: NTIS

A method is described for solving a set of linear inequalities expressed in binary variables. Both methods rely on the implicit enumeration principle and the Balas additive algorithm. They have been specially arranged for computer processing. ESRO

N71-30584# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ON THE AXIOMATIC PROOF OF THE ASYMPTOTICAL RELATIONS FOR THE AVERAGED AMPLITUDE
E. P. Sebad and Yu. M. Lomsadze 1970 20 p refs
(ITF-70-79) Avail: AEC Depository Libraries

There is continued the realization of the general program

of obtaining the physical corollaries of the axiomatic approach without any a priori purely mathematical postulating of the class of the used generalized functions. A strict definition of the averaged asymptotic amplitude is given, and it is proven that because of the microcausality, it satisfies all the conditions of the Phragmen–Lindelof–Nevanlinna generalized maximum principle in the upper omega halfplane and on the bound, and, consequently, all the theorems of the type Pomeranchuk's theorem must be fulfilled for it under corresponding conditions on the real axis. NSA

N71-30567# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
FIELDS AND LOCAL OBSERVABLES IN THE AXIOMATIC ALGEBRAIC THEORY WITH SUPERSELECTION RULES
S. S. Khoruzhii 1970 24 p ref
(ITF-70-66-E) Avail: AEC Depository Libraries

The new algebraic theory of superselection rules proposed recently is applied to the problem of constructing field quantities from local observables. The structure of the set of vectors analytic for the energy is described in detail and the cyclic and separating vectors of different algebras of local (global) observables are found. The physical equivalence of coherent superselection sections is proved, and a number of the necessary and sufficient conditions of their local unitary equivalence is obtained. The conditions of the duality theorem are investigated as well as the relation between the duality and local unitary equivalence properties. The results obtained are compared with a previous treatment of the problem. Author (NSA)

N71-30576# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
REIMANN'S METHOD OF THE INVERSE PROBLEM OF THE SCATTERING THEORY. PART 2
H. I. Gugushwili and Yu. L. Mentkovskii 1970 11 p refs In RUSSIAN
(ITF-70-76-P) Avail: AEC Depository Libraries

The estimates of the Riemann's function and the kappa-function obtained previously are improved and the method of their obtaining is generalized for the case of arbitrary angular momentum l. Author (NSA)

N71-30577*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPLINE QUADRATURE
J. D. Scudder Jul. 1971 29 p refs
(NASA-TM-X-65618; X-692-71-200) Avail: NTIS CSCL 12A

A non-iterative quadrature algorithm is presented which is based on a cubical spline interpolant. Since the underlying interpolant can even interpolate data which is unequally spaced in abscissa, the proposed quadrature algorithm can equally handle this type of data or equispaced data. Since the underlying interpolant is the smoothest C squared function which interpolates all the data, numerical quadrature by this technique minimizes spurious contributions to the integral which often result by least squares techniques. Simpson's 1/3 or other similar multiple rules which implicitly employ a polynomial interpolate. A direct comparison for equispaced data between this algorithm, Simpson's 1/3 rule, and the exact analytic quadrature for a wide range of polynomial and transcendental integrands shows that the algorithm is generally five times more accurate than Simpson's 1/3 rule. Author

N71-30578# College de France, Paris. Laboratoire de Physique Atomique et Moleculaire.
RATIONAL APPROXIMATIONS AND PHENOMENOLOGICAL MODELS [APPROXIMATIONS RATIONNELLES ET MODELES PHENOMENOLOGIQUES]
M. Benayoun and Ph. Leruste Dec. 1970 21 p refs In FRENCH; ENGLISH summary
(PAM-70-9) Avail: AEC Depository Libraries

An analysis was made of phenomenological models associated with the Breit–Wigner formulas and the effective range theory of Ross and Shaw. An undefined wave and a class of weight functions are considered. It is proved that in general these models are rational approximations of the D/D formalism and irreducible with respect to one another. The D/D formalism is expressed for the undefined wave, and the degree law of the B wavelength(s)-functions and the zerology of D are determined. NSA

N71-30579*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A LEAST SQUARE DISTANCE CURVE FITTING TECHNIQUE
John Q. Howell Washington Jul. 1971 24 p refs
(NASA-TN-D-6354; L-7675) Avail: NTIS CSCL 12A

A method is presented for fitting a function with n parameters y = f(alpha sub 1,alpha sub 2,. . .,alpha sub n; x) to a set of N data points in a manner that minimizes the sum of the squares of the distances from the data points to the curve. A differential correction scheme is used to solve the parameters in an iterative manner until the best fit is obtained. Two methods for finding the distances from the data points to the curve and a listing of the curve fitting computer program are also given Author

N71-30597# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Information Processing Computer Science.
ON THE USE OF MAJORANTS FOR STRICT ERROR ESTIMATION OF NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS
Torsten Stroem [1970] 39 p refs Sponsored by Swed. Board for Tech. Develop.
(NA-70-10) Avail: NTIS

The problem is that of economizing a strict error estimation by using a priori information on the structure of a system of ordinary differential equations consisting of 40 or more simultaneous equations. The results are to be used as a basis for future research. ESRO

N71-30600# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Information Processing Computer Science.
ABSOLUTELY MONOTONIC MAJORANTS: A TOOL FOR AUTOMATIC STRICT ERROR ESTIMATION IN THE APPROXIMATE CALCULATION OF LINEAR FUNCTIONALS
Torsten Stroem [1970] 41 p refs
(NA-70-23) Avail: NTIS

An ALGOL program has been used to construct majorants in linear vector spaces to be used in the error estimation, applied to absolutely and completely monotonic functions. The properties of such functions are studied, and the automatic operator oriented construction of majorants is described. ESRO

N71-30619# Democritus Nuclear Research Center, Athens (Greece). Physics Div.
ANALYTIC SOLUTIONS OF THE REFERENCE SPECTRUM EQUATION
M. E. Grypeos Nov. 1970 24 p refs
(DEMO-70/24) Avail: AEC Depository Libraries

Analytic solutions of the fundamental equation of the reference-spectrum method for nuclear matter are obtained in the cases of the square-well and exponential potentials with hard cores. In the former case, analytic wave functions are obtained for every partial wave L. These wave functions are expressed in terms of spherical Bessel and Hankel functions or in terms of spherical Bessel, Hankel, and Neumann functions of order L. In the latter case, an analytic expression is obtained for the s-wave function only. This is given in terms of the transcendental functions

G + or − nuon(r) and M sub + or −. Nu(r), which are defined as series of well known functions. Finally, an application is made to the calculation of the well depth of a Lambda hyperon particle in its ground state in nuclear matter. Author (NSA)

N71-30653# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

ANALYSIS OF THE DOUBLET STRUCTURE OF THE Q-RESONANCE BY FOURIER ALGORITHM

V. M. Dubovik, B. L. Markovski, L. M. Soroko, and T. A. Strizh 1971 10 p refs

(JINR-E2-5656) Avail: AEC Depository Libraries

The experimental data on Q (1240 to 1400) are reanalyzed by the method of the Fourier algorithm. It is shown that the Q-peak results from an incoherent superposition of two components, the distance between their centers being Delta = (137.0 + or − 8) MeV. Attempts to extract the Breit−Wigner widths of the doublet components are made. Author (NSA)

N71-30713# Naval Research Lab., Washington, D.C.

A FORTRAN COMPUTER PROGRAM FOR CALCULATING THE PROLATE SPHEROIDAL RADIAL FUNCTIONS OF THE FIRST AND SECOND KIND AND THEIR FIRST DERIVATIVES Interim Report

B. J. King, R. V. Baier, and S. Hanish 30 Mar. 1970 35 p refs

(AD-722648; NRL-7012) Avail: NTIS CSCL 12/1

The solutions of the Helmholtz wave equation in prolate spheroidal coordinates can be obtained by separation of variables. The subject of this report is a Fortran computer program called PRAD which calculates numerical values to the solutions of the resulting ordinary differential equation for the radial coordinate. The printed output of PRAD consists of radial functions of the first and second types, their first derivatives, the separation constants or eigenvalues, and an accuracy check. The report describes the computer program PRAD and briefly reviews the theory of prolate spheroidal wave functions. A computer listing of PRAD along with some sample output is included in an appendix. Author (GRA)

N71-30714# Naval Research Lab., Washington, D.C.

A FORTRAN COMPUTER PROGRAM FOR CALCULATING THE OBLATE SPHEROIDAL RADIAL FUNCTIONS OF THE FIRST AND SECOND KIND AND THEIR FIRST DERIVATIVES Interim Report

A. L. Van Buren, R. Vibaier, and S. Hanish 20 Jan. 1970 34 p refs

(AD-722649; NRL-6959) Avail: NTIS CSCL 12/1

The Helmholtz or scalar wave equation is separable in oblate spheroidal coordinates with solutions Psi. The subject of this report is a Fortran computer program called OBRAD which numerically evaluates the radial solutions. The printed output from OBRAD consists of radial functions of the first and second kind, their first derivatives, the separation constants or eigenvalues, and an accuracy check. This report first describes the input data cards and the output format. The theory of the oblate spheroidal wave function is then discussed. A description of the principal internal features of OBRAD is then given. Finally a computer listing of OBRAD is attached as an appendix. Author (GRA)

N71-30720# Naval Research Lab., Washington, D.C. Mathematics Research Center.

FINITE-TIME STABILITY OF LINEAR DISCRETE-TIME SYSTEMS Final Report

Leonard Weiss and Jong-Sen Lee 31 Mar. 1971 10 p refs

(AD-722654; NRL-7232; Rept-71-3) Avail: NTIS CSCL 12/1

A unified approach to finite-time stability of linear discrete-time systems is developed in this paper. Some results from linear algebra are used in deriving new and computationally feasible finite-time stability criteria. Connections are made to the Lyapunov-like nonlinear theory of finite-time stability. Corresponding results are also derived for stochastic linear discrete-time systems. Author (GRA)

N71-30816# Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Centre d'Automatique.

STOCHASTIC LINEAR MODELS [MODELES STOCHASTIQUES LINEAIRES]

P. Faurre Nov. 1970 55 p refs

(Contract F61052-70-C-0023)

(AD-722468; AFOSR-71-1019TR) Avail: NTIS CSCL 12/1

External (i.e. via covariances) and internal (i.e. via a Markov process) descriptions of Gaussian stochastic processes are explained. The canonical decomposition of stationary Markov processes in purely nondeterministic and purely deterministic parts is given and is shown to be closely related to the decomposition of a linear system in controllable and noncontrollable parts. Then an algorithm solving the positive real lemma giving a Markovian representation of a stochastic process is given. This algorithm is essentially a Riccati-type equation and is superior to classical factorization methods in the multi-dimensional case. Author (GRA)

N71-30880# University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.

A PRIORI BOUNDS FOR THE RICCATI EQUATION

R. S. Busy May 1971 21 p refs Presented at 6th Berkeley Symp. on Math. Statistics and Probability, 1970

(Grant AF-AFOSR-1244-67)

(AD-722597; AFOSR-71-1130TR) Avail: NTIS CSCL 12/1

In this paper the interest centers on the discrete matrix Riccati equation with emphasis on the study of the asymptotic behavior of its covariance matrix solution. Author (GRA)

N71-30893# National Aerospace Lab., Tokyo (Japan).

A CALCULATION OF TEMPERATURE DISTRIBUTION BY APPLYING GREEN'S FUNCTION TO A TWO DIMENSIONAL LAPLACE'S EQUATION

Hideaki Nishimura 1971 27 p refs In JAPANESE; ENGLISH summary

(NAL-TR-234) Avail: NTIS

The Green function was applied to the two dimensional Laplace equation for calculation of the temperature distribution in the cooled blade of the gas turbine. Two examples of temperature distribution calculations are given, ons of them being the case in which boundaries consist of two concentric circles, and the other the case in which boundaries consist of three configurations (one is an airfoil forming the outer boundary and two others being circles forming the inner boundaries). Author

N71-30894# System Development Corp., Santa Monica, Calif.

RELIABILITY STUDY OF DAMAGE AND REDUNDANCY FOR SYSTEMS Final Progress Report

Bennet P. Lientz 31 Mar. 1971 12 p

(Contract F44620-70-C-0078)

(AD-722469; TM-(L)-4560/003/00; AFOSR-71-0946TR) Avail: NTIS CSCL 12/1

During the period covered by this report a number of results were obtained and procedures developed which pertain directly to reliability and cumulative damage. In addition, applications of the work to traffic flow situations were explored. All of these topics are presented in this report with references to work to be published and discussions of future applications to communication and control networks. Author (GRA)

N71-30915# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

ZERO-SLOPE LIMIT OF THE DUAL RESONANCE MODEL

J. Scherk Mar. 1971 26 p refs
(LPTHE-71/17) Avail: NTIS

It is shown that in the zero-slope limit, the unitarized dual resonance model reduces to the phi cubed theory. Author

N71-30934*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF A DOCUMENT RETRIEVAL SYSTEM USING PATTERN RECOGNITION AND MATHEMATICAL PROGRAMMING TECHNIQUES
Steven R. Borbash, Jr. (Ph.D. Thesis - Pittsburgh Univ.) Jul. 1970 280 p refs
(NASA-TM-X-67236) Avail: NTIS CSCL 12A

A training set (TS) of document records with assigned utilities and a utility threshold defining document relevance are provided by a user. The TS is processed to give Boolean combinations of index terms for searching a document file. A linear utility prediction function (LUPF) is fitted to the TS documents using selected index terms. The LUPF is thresholded and the resulting pseudo-Boolean inequality is solved, giving term combinations for retrieving relevant documents. Algorithms are presented and testing is discussed. Author

N71-30947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE MONTE CARLO TECHNIQUE
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 221-239 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 12A

By extending the Monte Carlo model of radiative energy exchange for surface interaction problems, it is possible to account for a large variety of effects in gas radiation problems. This can be done without resorting to the simplifying assumptions that are often necessary in analytical approaches. Author

N71-31141. Maryland Univ., College Park.
BROKEN SU(3) SUM RULES DERIVED FROM THE ASYMPTOTIC SU(3) SYMMETRY
Gerald M. Fourez (Ph.D. Thesis) 1969 110 p
Avail: Univ. Microfilms Order No. 70-12920

Several results are derived from the broken SU(3) SU(3) chiral algebra with a technique called the SU(3) approximation. The coupling constants for the decay of JP = 1(+) mesons are calculated and the width of the K particles belonging to these multiplets are predicted; the results are in agreement with the present (but still unreliable) experimental data. The mixing angle between K sub A and K sub C (belonging respectively to the J sup (PC) = 1(+-) and 1(++) multiplets) is found to be around 12 deg. Mass sum rules are derived from (V sub neutral K, A pion(-) = 0 and (V sub neutral K, A sub neutral K) = 0 and the results from these different assumptions are compared. The influence of the mixing angle of the I = 0 particles is studied. Sum rules for some of the decay coupling constants of J = 3/2, 5/2 baryons are derived. The F wave decay of the J = 5/2 baryon is shown to be negligible compared with the P wave decay. The mass of the Xi hyperon particle (5/2(+)) is predicted. Finally the alpha = F/D+F ratio for the weak coupling constants of the Roper octet is calculated. Dissert. Abstr.

N71-31161*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
ESTIMATING THE PARAMETERS OF THE CHI-SQUARE AND SOME RELATED DISTRIBUTIONS USING QUANTILES
I. Eisenberger 15 Jul. 1971 29 p refs
(Contract NAS7-100)
(NASA-CR-119318; JPL-TR-32-1532) Avail: NTIS CSCL 12A

A two-parameter family of distributions is generated by considering the random variable y sub n = summation, from i = 1 to n, of (x sub i) square, where the x sub i are independent and distributed N(0,sigma square). For sigma square = 1, y sub n is said to have the chi square distribution with n degrees of freedom. Sample quantiles are used in solving the following estimation problems associated with this distribution: estimating sigma square when n is known, estimating n when sigma square = 1, estimating the product n(sigma square) when neither n nor sigma square is known, estimating both n and sigma square when neither is known, and estimating sigma for the special cases where v sub 2 = sq root of (y sub 2) and v sub 3 = sq root of (y sub 3). Monte Carlo methods are used in applying the various estimators, and the results are listed. Author

N71-31169*# Scripta Technica, Inc., Washington, D.C.
PERIODIC AND ALMOST PERIODIC SOLUTIONS OF DIFFERENTIAL SYSTEMS [SOLUTIONS PERIODIQUES ET PRESQUE-PERIODIQUES DES SYSTEMES DIFFERENTIELS]
P. Talpalaru NASA Aug. 1970 13 p refs Transl. into ENGLISH from An. Stiint. Univ. Al. I. Cuza, Iasi, Sect. 1 (Romania), v. 15, 1969 p 375-385
(Contract NASw-2036)
(NASA-TT-F-13803) Avail: NTIS CSCL 12A

Problems concerning the existence of periodic and almost-periodic solutions of certain differential systems are treated. The fixed-point method (in the form of Banach's theorem) and the Lyapunov-function method are used for the investigation. Author

N71-31171# Laboratoire d'Automatique et de ses Applications Spatiales, Toulouse (France).
ANALYSIS OF BOOLEAN FUNCTIONS: METHOD USING THE DERIVATIVE. PART 1: THE NOTION OF THE BOOLEAN DERIVATIVE [ANALYSE DES FONCTIONS BOOLEENNES: METHODE UTILISANT LA NOTION DE DERIVEE. PREMIERE PARTIE: LA NOTION DE DERIVEE BOOLEENNE]
Jean Erceau Mar. 1971 15 p In FRENCH
(LAAS-NI-780-Pt-1) Avail: NTIS

Definitions and theorems on derivation and series development of Boolean functions are given. ESRO

N71-31172# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Information Processing Computer Science.
MINIMIZATION OF NORMS AND LOGARITHMIC NORMS BY DIAGONAL SIMILARITIES
Torsten Stroem [1970] 15 p refs
(NA-70-26) Avail: NTIS

In order to improve ordinary norms of matrices some modifications are investigated such as using an ordinary norm for a diagonally transformed matrix. Several types of norms are considered and their properties discussed. ESRO

N71-31205*# Texas Univ., Austin. Applied Mechanics Research Lab.
EQUIVALENCE OF THE PERTURBATION THEORIES OF HORI AND DEPRIT
J. A. Campbell and William H. Jefferys Jan. 1970 13 p refs Sponsored in part by NSF
(Grant NGR-44-012-046)
(NASA-CR-119364; TR-1011) Avail: NTIS CSCL 12A

A comparison is made between the perturbation theories of Hori and Deprit which are based on the use of Poisson brackets. Explicit relations between the determining functions for the two theories are indicated through the sixth order, these results having been obtained by a novel computer program. A general argument for the equivalence of the theories to all orders is given. Author

N71-31208*# Brown Univ., Providence, R.I.
LOCAL BEHAVIOR OF AUTONOMOUS NEUTRAL FUNCTIONAL DIFFERENTIAL EQUATIONS

Jack K. Hale [1971] 17 p refs
(Grant NGL-40-002-015; Contract DA-31-124-ARO(D)-270; Grant AF-AFOSR-0693-67D)
(NASA-CR-119360) Avail: NTIS CSCL 12A

A neutral functional differential equation is a model for a hereditary system which depends upon the present and past values of the state and the derivative of the state of the system as a function of time. A special class of these systems was recently introduced which is simple enough to have many interesting mathematical properties and yet sufficiently general to include retarded functional differential equations, difference equations, and several important applications. Considered separately, many of the results which were obtained appear at first glance to be special. Some basic problems for a more restricted class of neutral functional differential equations are formulated in an abstract manner and then the way in which the results contribute to a general qualitative theory in the neighborhood of an equilibrium point is indicated. Author

N71-31217# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
IDENTIFICATION OF MODEL PARAMETERS FROM INPUT OUTPUT DATA OF DYNAMIC SYSTEMS WITH TIME DELAYS
John Fong-Loor Lee (Ph.D. Thesis) Aug. 1970 275 p refs
(Grant AF-AFOSR-1502-68)
(AD-722864; AFOSR-71-1037TR) Avail: NTIS CSCL 12/1

The paper investigated identification problems for a dynamic system which can be described by differential-difference equations. Subjects important to the identification problem, such as controllability, observability, and equivalent systems were studied. Three identification schemes were developed. The determination of impulse response weighting matrix for a linear delay-differential system was studied and a realization algorithm was developed. An integral approximation method was developed for an off-line system identification in a finite time interval. An algorithm was also developed for an on-line identification according to the model reference control theory and Liapunov stability technique. The developed computational algorithm was verified by a digital simulation. Author (GRA)

N71-31235# Denver Research Inst., Colo. Div. of Mathematical Sciences.
BIFURCATION IN SINGULAR SELF-ADJOINT BOUNDARY VALUE PROBLEMS
Frank G. Hagin 1 Apr. 1971 36 p refs
(Grant AF-AFOSR-1923-70)
(AD-722682; MS-R-7125; AFOSR-71-1026TR) Avail: NTIS CSCL 12/1

The bifurcation phenomenon for nonlinear perturbations of a class of self-adjoint boundary value problems is studied. In particular, the class includes singular problems. It is shown that if lambda sub 0 is an eigenvalue of the linearized problem, there exists a set of solutions, (lambda,y), to the nonlinear problem for lambda near lambda sub 0. Author

N71-31240# California Univ., Los Angeles. School of Engineering and Applied Science.
A CHARACTERIZATION OF MEASURES FOR A CLASS OF CONTINUOUS-TIME, PARTIALLY OBSERVABLE MARKOV PROCESSES
Elliot Horowitz Dec. 1970 109 p refs
(Grant AF-AFOSR-1408-68)
(AD-722455; UCLA-ENG-7094; AFOSR-71-0994TR) Avail: NTIS CSCL 12/1

The report concerns itself with the problem of obtaining a characterization of the measures for a class of continuous -time, partially observable Markov processes. In particular, this investigation considers processes of the diffusion type which can be described by Ito stochastic integral equations where the drift coefficients may be unbounded. The measures which are to be characterized are the conditional probability measures for the current state of the system given the entire history of the observed portion of the process. The study provides some sufficient conditions to rigorously show that the desired conditional probability measures are absolutely continuous with respect to the Lebesgue measure defined on a Euclidean space. Hence the existence of the conditional probability density is established. Then it is rigorously demonstrated that an unnormalized version of the desired conditional density can be obtained as the limit of a sequence of random functions. Subsequently, the sequences of random functions are shown to be the unique solutions to a sequence of stochastic integral equations. Author (GRA)

N71-31265*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL METHOD AND FORTRAN PROGRAM FOR SOLVING POISSON'S EQUATION OVER AXISYMMETRIC REGIONS OF A SPHERE
Oliver W. Reese Washington Jul. 1971 57 p refs
(NASA-TN-D-6438; E-6121) Avail: NTIS CSCL 12A

This report describes a numerical method and FORTRAN program for solving Poisson's equation with a specified source term, in axisymmetric regions of a sphere bounded by the spherical coordinates r < or = 1, 0 < or = Theta sub 0 < Theta < or = Pi. Irregular mesh spacing is allowed in both the r and Theta directions, and the associated matrix equation is solved by a direct (noniterative) method. For a mesh with a maximum allowable number of 376 points, the program returns a solution in 6 to 7 seconds (IBM DCS 7094/7044 computer) and requires approximately 10,000 storages. Author

N71-31266# Environmental Science Services Administration, Boulder, Colo. Earth Sciences Labs.
CONVERGENCE OF ITERATIVE METHODS APPLIED TO LARGE OVERDETERMINED LINEAR AND NONLINEAR SYSTEMS OF EQUATIONS USING LEAST SQUARES
Charles O. Stearns and Leroy R. Alldredge Aug. 1970 14 p refs
(ESSA-TR-ERL-181-ESL-10) Avail: SOD $0.25

The nonlinear system represents a dipole model of the earth's geomagnetic field, which is generated from spherical harmonic coefficients. This system of 64 unknowns and 1836 equations is solved by a maximum neighborhood method, which is an optimum interpolation between the well known Taylor's series and steepest descent methods. The original given values of the generated field are as large as 60,000 gamma, whereas a rms residual of 27.9 gamma is obtained with 173 iterations. The linear system of equations represents dipole changes required to account for the earth's secular change field which is generated from spherical harmonic coefficients. The dipole parameters computed from the nonlinear model are used as input parameters. The system contains 64 unknowns and 612 equations and is solved using a Chebyshev polynomial iterative method. The generated field has a rms value of 45 gamma per year. An rms residual of 2.5 gamma per year was obtained after 25,000 iterations. Author

N71-31275# Wisconsin Univ., Madison. Dept. of Statistics.
ASYMPTOTOTIC THEORY FOR TWO ESTIMATORS OF THE GENERALIZED FAILURE RATE FUNCTION
Prakasa Rao and J. Van Ryzin Nov. 1970 22 p refs
(Grant NSF GP-9324)
(PB-197482; UWIS-DS-70-256) Avail: NTIS CSCL 12A

Let Y sub 1 = or < Y sub 2 = or < ... = or < Y sub n be an ordered sample of n observations from an unknown distribution function F with density. Let G be a known distribution function with density g. Then, r (x) = f (x)/g G sup (-1) (F (x)), defined for all x for which g G sup (-1) (F(x)) not equal to zero.

is called the generalized failure rate function. Two estimators of r (x) based on the sample of size n are proposed and studied. Author (GRA)

N71-31285# Denver Research Inst., Colo. Div. of Mathematical Sciences.
FUNCTIONS WHOSE FOURIER TRANSFORM DECAYS AT INFINITY: AN EXTENSION OF THE RIEMANN LEBESGUE LEMMA
Norman Bleistein and Richard A. Handelsman Apr. 1971 11 p refs Sponsored in part by NSF
(Grant AF-AFOSR-1923-70)
(AD-722681; MS-R-7120; AFOSR-71-0984TR) Avail: NTIS CSCL 12/1

An extension of the Riemann Lebesgue Lemma is stated and proved. The class of functions considered are locally L sub 1 on 0, infinity and have asymptotic expansion as T approaches infinity. GRA

N71-31313# Massachusetts Inst. of Tech., Cambridge. Operations Research Center.
A WEAK CONVERGENCE THEOREM FOR ORDER STATISTICS FROM STRONG-MIXING PROCESSES
Roy E. Welsch Dec. 1970 30 p refs
(Contracts N00014-67-A-0112-0015; DA-31-124-ARO-D-209)
(AD-722833; TR-57; AROD-968-64-M) Avail: NTIS CSCL 12/1

The paper provides sufficient conditions for the weak convergence in the Skorohod space D sup d (a,b) of the processes ((Y sub (1,(nt)) - b sub n)/a sub n, (y sub (2,(nt)) - b sub n)/a sub n,..., (Y sub (d,(nt)) - b sub n)/a sub n), 0 < a = or < t = or < b where Y sub (i,n) is the ith largest among (X sub 1, X sub 2,..., X sub n), (a sub n) and (b sub n) are normalizing constants, and < (X sub n) : n = or > 1 > is a stationary strong-mixing sequence of random variables. Under the conditions given, the weak limits of these processes coincide when those obtained are a sequence of independent identically distributed random variables. Author (GRA)

N71-31314# Ohio State Univ., Columbus. Computer and Information Science Research Center.
PATTERNS AND ALGORITHMS
Jerome Rothstein Jan. 1971 13 p refs
(Grant NSF GN-534.1)
(PB-197604; OSR-CISRC-TR-71-1) Avail: NTIS CSCL 12A

A display manifold (quadratic lattice) is filled with symbols satisfying axioms of some algebraic structure by using the production rules of the structure and some initial or boundary condition to start the filling process. The algorithms operate locally to generate global patterns, often of great beauty. The tremendous variety in pattern obtained with a fixed algorithm can be interpreted as adaptations of the algorithms to different conditions, imposed externally. Examples from nature strongly suggest that inorganic and biological structures of many kinds may well be constructed in accordance with similar principles. Connections with other branches of mathematics and computer science (universal algebras, number theory, parallel computation, cellular automata) are pointed out. Author (GRA)

N71-31352*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NONLINEAR SYSTEMS IDENTIFICATION IN PRESENCE OF NONUNIQUENESS
Jean-Noel Aubrun Washington Aug. 1971 80 p refs
(NASA-TN-D-6467; A-3807) Avail: NTIS CSCL 12A

The problem of identifying a set of parameters that will match the input-output of a mathematical model to that of a physical system is examined. Except for particular cases, there was no practical method to determine if such parameter values are unique. A general process of parameter identification is described that addresses this problem and uses geometrical concepts in terms of which the nonuniqueness problem can easily be defined. A digital computer algorithm is developed that analyzes the structure of a space defined by the parameter sensitivity functions and the output data set. The algorithm deduces an optimal set of parameters to be uniquely identified, determines the relationships between dependent parameters, and specifies which parameters can be obtained with a priori knowledge of others. It does not require canonical or linear equations for the model but maintains the physical identity of the parameters. A corresponding FORTRAN 4 program was written. This technique is illustrated by the identification of the AMES three degrees of freedom satellite simulator. Examples of nonuniqueness were found and analyzed successfully by the algorithm, demonstrating its ability to cope with strongly nonlinear cases. Author

N71-31378# Ohio State Univ., Columbus. Computer and Information Science Research Center.
SOME PROCEDURES FOR FINDING SUBSTITUTION PROPERTY PARTITIONS, SUBSTITUTION PROPERTY COVERS, AND COVER PAIRS FOR FINITE STATE SEQUENTIAL MACHINES
Stephen Roy Dillon 1970 89 p refs
(Grant NSF GN-534.1)
(PB-197643; OSU-CISRC-TR-70-3) Avail: NTIS CSCL 06D

The concept of second order substitution property covers and second order cover pairs is introduced. Nearly identical to partitions in their mathematical properties, second order covers are more numerous and are available on a wider range of sequential machines. Procedures for finding the desired partitions and covers are also formalized. Author (GRA)

N71-31379# State Univ. of New York, Stony Brook. Dept. of Electrical Engineering.
CONTROLS SYSTEMS TECHNIQUES APPLICABLE FOR USE IN SYNTHESIS OF FLIGHT CONTROL SYSTEMS
S. S. L. Chang, Theodore K. Peng, Shiba Panda, Ching-Huang Hsu, and Hsiao Chang Chou 1970 18 p refs
(Grant AF-AFOSR-1890-70)
(AD-722458; AFOSR-70-2810TR) Avail: NTIS CSCL 12/1

The focal point of the effort is on the control of systems with an incompletely known process. When fuzzy dynamic programming is applied to control systems with incompletely known or changing dynamics, it is considerably simpler than minimizing the sensitivity function, and yields a globaly good closed-loop control. It also furnishes a link between dynamic programming and Lyapunov stability theory. Another aspect of the work on fuzzy dynamic programming is aimed at developing computer algorithm for obtaining the guaranteed cost function (or guaranteed cost matrix for linear systems), and also to apply it to learning and adaptive systems. Another area investigated is the inverse problem of guaranteed cost control: When is a controller for a system with unknown parameters a guaranteed cost controller. Necessary and sufficient condition for a controller being a guaranteed cost controller is obtained for a certain class of linear systems. Author (GRA)

N71-31380# Johns Hopkins Univ., Baltimore, Md. Dept. of Statistics.
SOME ASYMPTOTIC PROPERTIES OF A TWO-DIMENSIONAL PERIODOGRAM
Marcello Pagano Oct. 1970 25 p refs
(Contract AF 49(638)-1302)
(AD-722873; AFOSR-71-1094TR; TR-146) Avail: NTIS CSCL 12/1

The two-dimensional periodogram has been proposed as an estimator of the spectral density of a real, homogeneous, random field defined over a regular lattice on the plane. In the present paper, the asymptotic finite dimensional distribution functions of the periodogram of an independent, orthonormal field which

obeys the Lindeberg-Feller condition are found. This result is extended to cover the periodogram of random fields that may be represented as a moving average of such an orthonormal field. This extension is verified by showing that, save for a scale factor, the asymptotic finite dimensional distribution functions of the two periodograms are equal. The rate of convergence to zero of the mean difference of the two random variables obtained by evaluating the above mentioned periodograms at any fixed point is obtained by paralleling Olshens approach to a similar analysis of the one-dimensional periodogram. The analysis, however, requires defining a certain class of Lipschitz functions in two dimensions, and the derivation of some properties of this class of functions. Author (GRA)

N71-31381# Joint Publications Research Service, Washington, D.C.

PROBABILISTIC AUTOMATA

D. A. Pospelov 12 Jul. 1971 102 p refs Transl. into ENGLISH of the book Veroyatnostnyye Avtomaty' Moscow, Energiya Press, 1970 88 p

(JPRS-53569) Avail: NTIS

Various problems related to the synthesis of probabilistic automata and the use of devices of this type for the control of complex processes are considered. The book is designed for engineers in the areas of automation, computer equipment and control systems, as well as graduate students and senior students specializing in the area of engineering cybernetics. Author

N71-31433# Brown Univ., Providence, R.I. Div. of Applied Mathematics.

STOCHASTIC CONTROL AND NON-LINEAR FILTERING

Scientific Interim Report

Wendell M. Fleming Apr. 1971 13 p refs Presented at 3d Southeastern Symp. on System Theory, Atlanta, 5 - 6 Apr. 1971

(Grant AF-AFOSR-0693-67)

(AD-722875; AFOSR-71-1087TR) Avail: NTIS CSCL 12/1

The purpose of the paper is to briefly survey recent developments in theories of optimal stochastic control and non-linear filtering, for models with continuous time and continuous state parameters. Author (GRA)

N71-31434# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences Section.

ON PERFORMANCE SENSITIVITY OF OPTIMAL CONTROL SYSTEMS

Eliezer Kreindler Jul. 1971 16 p refs Submitted for publication

(RM-514J) Avail: NTIS

Formulas for the differential, with respect to plant parameters of an optimized performance index (performance sensitivity), are extended to include hard (instantaneous) as well as soft (isoperimetric) constraints on the control. In particular, this extends (to discontinuous and bang-bang controls) the Pagurek-Witsenhausen result on the equality of such differentials for open-loop and closed-loop optimal systems. Author

N71-31461# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Information Processing.

ABSOLUTELY MONOTONIC MAJORANTS AND THEIR USE FOR AUTOMATIC STRICT ERROR ESTIMATION IN SOME AREAS OF NUMERICAL ANALYSIS

Torsten Stroem Feb. 1971 9 p refs

Avail: NTIS

A combination of numeric and non-numeric computational methods is presented for determining strict a priori error bounds. The construction and basic properties of feasible triples and the automatic determination of a majorant for a given function by computers are discussed. The numerical quadrature, derivative and error term estimation, one variable functions with values and strict range estimation, and error bounds for numerical solution of ordinary differential equation systems are included. J.M.

N71-31489# Naval Postgraduate School, Monterey, Calif.

TWO ALGORITHMS FOR FINDING THE ABSOLUTE m-CENTER OF A GRAPH

John Jesse Reed (M.S. Thesis) Mar. 1971 75 p refs

(AD-722589) Avail: NTIS CSCL 12/1

Two algorithms for finding the absolute m-center are developed, combining the ideas of Hakimi, Gillespie, and Rosenthal and Smith. The first algorithm developed is essentially a hand-computational method. It is based on partitioning the graph into m subgraphs centered on the elements of the vertex m-center. The minimum distance tree rooted on each element of the vertex m-center is then formed and modified to yield the central path and thus the absolute center of each subgraph. This algorithm will give the absolute M-centers of a graph if each of these m-central paths passes through an element of the vertex m-center. The second algorithm is an iterative search of all possible sets of m edges on which the absolute m-center may be located. It is less efficient than the algorithm of Rosenthal and Smith when m = 1, but appears to be more efficient for m larger than 1. It does eliminate the problems encountered by the Rosenthal-Smith algorithm in handling peripheral vertices. Author (GRA)

N71-31490# Wisconsin Univ., Madison. Dept. of Statistics.

A REMARK ON SOME CHARACTERIZATION OF CONTIGUITY

G. G. Roussas and A. Soms Oct. 1970 17 p refs

(Grant NSF GP-20036)

(AD-197476; UWIS-DS-70-255) Avail: NTIS CSCL 12A

In the process of establishing the equivalence of various characterizations, it is convenient to pass from a given pair of contiguous sequences of probability measures (P-sequences) to another such pair (Q-sequences) which is close to the given one in the L sub 1-norm sense, and, in addition, the members within each one of the Q-sequences are mutually absolutely continuous. Then the equivalence in question is found by employing the Q-sequences and the desired equivalence for the P-sequences is proven by utilizing the L sub 1-norm proximity of the two pairs of sequences in question. Author (GRA)

N71-31492*# Scripta Technica, Inc., Washington, D.C.

PROBLEM SOLUTION BY THE LARGE PARTICLE METHOD

S. P. Lomnev, ed. NASA Jul. 1971 67 p refs Transl. into ENGLISH of the publ. Resheniye Zadach Metodom Krupnykh Chastits' Moscow, Acad. Sic., USSR. Computer Center, 1970

(Contract NASw-2036)

(NASA-TT-F-670) Avail: NTIS CSCL 12A

Methods, based on replacing the continuity equations or their analogs by large particle equations of motion are used to solve problems in electrohydrodynamics, gas dynamics, hydrodynamics and solid state physics. The particles in cell, or PIC, method of solution is used to calculate motions of charged particles in an electric field, in electric beam behavior, in supersonic gas flow, and during the evolution of stars. G.G.

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N71-30585# Ludwig-Maximilians-Universitat, Munich (West Germany). Inst. fuer Meteorologie.

INTERPRETATION OF ENERGY-, CO-, AND QUADRATURE SPECTRA OF METEOROLOGICAL PARAMETERS [ZUR INTERPRETATION VON ENERGIE-, KO- UND QUADRATURSPEKTREN METEOROLOGISCHER PARAMETER]

Otto Georg Walk Sep. 1970 59 p refs In GERMAN Sponsored by Deut. Forschungsgemeinschaft *Its* 9. Ber. aus den Arb. der Meteorol. Sta. beim Forsch. Reaktor Muenchen
(Mitt-20) Avail: NTIS

The energy spectra, covariance spectra, and quadrature spectra of wind velocity and atmospheric temperature are derived from tower measurements and represented graphically. The errors involved are discussed and control experiments on the noise level were carried out. ESRO

N71-30825# Istituto di Fisica dell'Atmosfera, Rome (Italy).
CHARTS OF AVERAGE REFRACTIVE INDEX OF ATMOSPHERE IN THE MEDITERRANEAN EUROPE [CARTE MEDIE DELL'INDICE DI RIFRAZIONE SULL'EUROPA MEDITERRANEA]
A. Zancla Sep. 1970 42 p refs In ITALIAN Prepared jointly with Aeron. Mil. Ital.
(IFA-STR-13) Avail: NTIS

The knowledge of the average refractive index, variable with time, meteorological conditions, and position is essential to understand the radio and radar propagation. A series of charts of the average refractive index were calculated using a formula N= N(p,T) + N(e,T) showing the dependence of N from pressure, temperature, and water vapor pressure "e". The variables involved were calculated by 134 meteorological stations and laboratories distributed in the European Mediterranean area and the values were computed, and averaged over the period 1951–1960. The results are presented in the form of geographical charts giving the mean atmospheric refractivity for the months of January, February, April, July, and October, and showing some anisotropies which are interesting for the study of radio wave propagation. ESRO

N71-30790# Joint Publications Research Service, Washington, D.C.
METEOROLOGY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 254 15 Jun. 1971 p 5–15 refs (See N71-30788 18-30)
Avail: NTIS

Soviet news releases on atmospheric optics and actinometry conference are given, including symposiums on satellites and radiation, optical sounding of the atmosphere and inverse problem solving, atmospheric gas spectroscopy, atmospheric propagation of laser radiation, and atmospheric dynamics and radiation. Hail suppression service expansion is announced. Abstracts on various meteorological literature are presented, including eleven year solar induced pressure wave in the Southern Hemisphere, Antarctic snow accumulation and level of the world ocean, and stability of mean monthly wind parameters in Antarctica. J.A.M.

N71-30828 World Meteorological Organization, Geneva (Switzerland).
VERTICAL WIND SHEAR IN THE LOWER LAYERS OF THE ATMOSPHERE
1969 264 p refs Partly in ENGLISH and partly in FRENCH *Its* Tech. Note 93
(WMO-230-TP-123) Copyright. Avail: Issuing Activity

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1. VERTICAL WIND SHEAR IN THE BOUNDARY LAYER R. B. Pettitt (Meteorol. Serv. of Can.) and R. G. Root (Meteorol. Serv. of Can.) p 1–30 refs (See N71-30829 18-20)

2. PRELIMINARY ANALYSIS OF CANADIAN WIND-SHEAR DATA F. B. Muller (Meteorol. Serv. of Can.) and C. M. Mushkat (Meteorol. Serv. of Can.) p 31–36 (See N71-30830 18-20)

3. DYNAMIC STUDY OF THE 0–100 m LAYER AT THE SITE OF PARIS-NORTH J. Saissac (Direc. de la Meteorol. Natl., Paris) p 37–57 (See N71-30831 18-20)

4. DYNAMIC STUDY OF THE 0–100 M LAYER OVER THE SITE OF ROISSY-EN-FRANCE J. Saissac (Direc. de la Meteorol. Natl., Paris) p 59–102 refs (See N71-30832 18-20)

5. A REPORT OF THE STATISTICAL INVESTIGATIONS ON VERTICAL WIND SHEAR IN THE LOWER LAYERS AT THUMBA p 103–168 (See N71-30833 18-20)

6. VERTICAL WIND SHEAR IN THE LOWER LAYERS AT THE TOKYO INTERNATIONAL AIRPORT K. Kusanod (Japan Meteorol. Agency), Y. Suzuki (Japan Meteorol. Agency), and H. Takei (Japan Meteorol. Agency) p 169–183 (See N71-30834 18-20)

7. DEPENDENCE OF OBSERVED LOW-LEVEL WIND SHEAR ON AVERAGING PERIOD AND LAPSE RATE P. J. Rijkoort (Koninkl. Ned. Meteorol. Inst.) p 185–194 (See N71-30835 18-20)

8. WIND SHEAR IN THE LOWER ATMOSPHERE K. G. Abramovic and V. G. Glazunov p 195–202 refs (See N71-30836 18-20)

9. A PRELIMINARY ANALYSIS OF SOME OBSERVATIONS OF WIND SHEAR IN THE LOWEST 100 FEET OF THE ATMOSPHERE FOR APPLICATION TO THE PROBLEM OF THE CONTROL OF AIRCRAFT ON APPROACH C. F. Roberts p 203–218 refs (See N71-30837 18-20)

10. ESTIMATION OF THE 90-m WIND FROM LOW-LEVEL OBSERVATIONS S. R. Henna and H. A. Panofsky p 217–250 refs (See N71-30838 18-20)

N71-30829 Meteorological Service of Canada, Ottawa (Ontario).
VERTICAL WIND SHEAR IN THE BOUNDARY LAYER
R. B. Pettitt and R. G. Root *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 1–30 refs (See N71-30828 18-20)
Copyright. Avail: Issuing Activity

The results of a short study on boundary-layer vertical wind shear, i.e. the rate of wind velocity with height in the first 200 feet above the ground are given. Vertical wind shear was investigated at two towers: one in Montreal, Quebec, the other at Whiteshell, Manitoba. Following a discussion of relevant theory, the data, for both sites, are examined separately. A comparison of the two sets of results are given. ESRO

N71-30830 Meteorological Service of Canada, Ottawa (Ontario).
PRELIMINARY ANALYSIS OF CANADIAN WIND-SHEAR DATA
F. B. Muller and C. M. Mushkat *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 31–36 (See N71-30828 18-20)
Copyright. Avail: Issuing Activity

Three wind and temperature records from Canadian instrument towers have been selected for analysis of some of the information they can provide concerning the frequency distribution of wind shears between upper and lower levels. Some details concerning the towers, their locations, and the nature of their wind records are provided, coupled with overall distributions of the wind shears measured at these stations over the usable period of record. A discussion of the interpretation of the results is provided, and recommendations given for further study of the problem from the point of view of aviation. The preliminary distributions were obtained in the course of editing the data into a suitable form. This edited form will greatly facilitate further analysis. This analysis includes frequency distributions under many combinations of conditions of season, time of day, vertical temperature difference, upper and lower wind directions, and speeds. Author (ESRO)

N71-30831 France. Direction de la Meteorologie Nationale, Paris.
DYNAMIC STUDY OF THE 0–100-m LAYER AT THE SITE OF PARIS-NORTH [ETUDE DYNAMIQUE DE LA COUCHE 0–100 M SUR LE SITE DE PARIS-NORD]
J. Saissac *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 37–57 In FRENCH (See N71-30828 18-20)

Copyright. Avail: Issuing Activity

A climatic study on the future site of the Paris-Nord Airport is carried out by means of temperature and wind measurement instruments distributed at seven different levels on a 100-m pylon. The instrumentation is described. ESRO

N71-30832 France. Direction de la Meteorologie Nationale. Paris

DYNAMIC STUDY OF THE 0-100-m LAYER OVER THE SITE OF ROISSY-EN-FRANCE [ETUDE DYNAMIQUE DE LA COUCHE 0-100 M SUR LE SITE DE ROISSY-EN-FRANCE]

J. Saissac *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 59-102 refs In FRENCH (See N71-30828 18-20)

Copyright. Avail: Issuing Activity

A dynamic study has been carried out on wind shear in the 0-100-m layer over Roissy-en-France airport site in order to investigate abnormal gradients of horizontal wind causing aircraft accidents during landing or takeoff. Wind and temperature profiles have been determined from measurements at 10, 40, and 80 m levels. A statistical study concludes that permanent measurement should be performed at 40 and 60 m levels where the correlation with 100 m is good. ESRO

N71-30833 World Meteorological Organization, Geneva (Switzerland).

A REPORT OF THE STATISTICAL INVESTIGATIONS ON VERTICAL WIND SHEAR IN THE LOWER LAYERS AT THUMBA

In its Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 103-168 (See N71-30828 18-20)

Copyright. Avail: Issuing Activity

A 200 ft meteorological tower has been erected at Thumba rocket launching facility, at a distance of 7 km from Trivandrum Airport, India. The results of statistical investigations based on wind data obtained from this tower over a period of two years are reported, giving information on vertical wind shear in view of facilitating the design and operation planning of supersonic aircraft. ESRO

N71-30834 Japan Meteorological Agency, Tokyo. Aviation Weather Service.

VERTICAL WIND SHEAR IN THE LOWER LAYERS AT THE TOKYO INTERNATIONAL AIRPORT

Kazuo Kusano, Yoshio Suzuki, and Hisanori Takei *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 169-183 (See N71-30828 18-20)

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The effect of vertical wind shear in the lower layer is one of the important meteorological factors which affect aircraft operation during landing and takeoff. An investigation has been carried out to study the nature and intensity of vertical wind shear. Owing to the lack of direct usable data at the Tokyo International Airport itself, the study has been made on the basis of the wind data obtained by three anemometers installed at 26, 107, and 253 m above the ground on a TV tower about 300 m high, which is located about 13 km north of the airport. The data used for this study are wind measurements at the TV tower from January to December, 1961, and surface observations at the airport. ESRO

N71-30835 Koninklijk Nederlands Meteorologisch Instituut, The Hague.

DEPENDENCE OF OBSERVED LOW-LEVEL WIND SHEAR ON AVERAGING PERIOD AND LAPSE RATE

P. J. Rijkoort *In* WMO Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 185-194 (See N71-30828 18-20)

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The necessity of statistical evidence on the influence of various parameters on wind speed differences over certain height intervals below 60 m led in 1955 and 1956 to experiments at the radio and television masts of Lopik, in the central area of the Netherlands. This area consists of flat grassland with relatively few trees, and is thus not unsuitable for wind experiments. The speed difference between two levels, hereafter called wind hear, was studied as a function of the speed-averaging interval and of the temperature lapse-rate. A relation was found between the wind shear averaged over a long period and the larger extremes of shear observed for short averaging periods. Incidentally, the dependence of the exponent of the wind profile power "law on stability parameters was examined. Author (ESRO)

N71-30836 World Meteorological Organization, Geneva (Switzerland).

WIND SHEAR IN THE LOWER ATMOSPHERE

K. G. Abramovic and V. G. Glazunov *In its* Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 195-202 refs (See N71-30828 18-20)

Copyright. Avail: Issuing Activity

A brief description of the results of investigations of vertical wind shear in the lower atmosphere (up to 1000 m) in the Soviet Union is given. Author (ESRO)

N71-30837 World Meteorological Organization, Geneva (Switzerland).

A PRELIMINARY ANALYSIS OF SOME OBSERVATIONS OF WIND SHEAR IN THE LOWEST 100 FEET OF THE ATMOSPHERE FOR APPLICATION TO THE PROBLEM OF THE CONTROL OF AIRCRAFT ON APPROACH

Charles F. Roberts *In its* Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 203-218 refs (See N71-30828 18-20)

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Measurements of wind shear in the lowest few hundred feet of the atmosphere are provided and analyzed as to their possible significance for aircraft approach. Wind shear values ranging between 3 and 6 knots per hundred feet appear to be characteristic of the lowest one hundred feet of the atmosphere under widely varying stability conditions. Extreme values of up to 10 knots per hundred feet were observed on one or two occasions. The expected upper limit of wind shear developed under some rather restrictive assumptions shows general agreement with observed values. Author (ESRO)

N71-30838 World Meteorological Organization, Geneva (Switzerland).

ESTIMATION OF THE 90-m WIND FROM LOW-LEVEL OBSERVATIONS

Steven R. Hanna and Hans A. Panofsky *In its* Vertical Wind Shear in the Lower Layers of the Atmosphere 1969 p 219-250 refs Sponsored by US Dept. of Commerce (See N71-30828 18-20)

Copyright. Avail: Issuing Activity

Hourly averages of temperature and wind were collected from a 90 m tower at Tyson's Corner, Virginia. From these observations, an empirical method was developed for the estimation of the wind at 90 m from wind and temperature at 30 m and below. The method accounted for about 80% of the variance of the 90 to 30 m wind ratio. Similarity theory was modified by the inclusion of the effects of Coriolis and pressure gradient forces in order to arrive at a theoretical equivalent to the empirical estimation process. Agreement between observations and theory was quite good. Due to the varying roughness characteristics of the terrain around the tower a dependence of roughness length on wind direction could be demonstrated; further, roughness decreased significantly when the ground was snow-covered. The roughness length during the summer varied from 50 cm for SW winds to 10 cm for NW winds; during the winter the value for NW winds decreased to 1 cm over open ground and 0.01 cm over snow-covered ground. The theoretical and practical relationships were valid for

unstable, neutral, and slightly stable stratification. In very stable air, no successful method was found for the estimation of the 90 m wind. An attempt to use the geostrophic wind as a predictor was not succcessful. Author (ESRO)

N71-30875# Istituto di Fisica dell'Atmosfera, Rome (Italy).
APPLICATION OF THE INFRARED TECHNIQUES TO METEOROLOGICAL INVESTIGATIONS [LE TECNICHE DELL'INFRAROSSO NELLE APPLICAZIONI METEOROLOGICHE]
M. Colacino and F. M. Vivona Apr. 1970 123 p refs In ITALIAN; ENGLISH summary
(IFA-SP-8) Avail: NTIS

Mention is made to the fundamental laws of the infrared radiation and of atmospheric emission and absorption in relation to the main problems relative to the applications of the infrared techniques in meteorology. Some radiometers widely used in meteorological researches are described. Moreover, the most important results achieved by employing such equipment are shown and lastly a brief note to the future prospects regarding the application of infrared techniques to the studies of meteorology and atmospheric physics, is made. Author (ESRO)

N71-30877 World Meteorological Organization, Geneva (Switzerland).
THE BEAUFORT SCALE OF WIND FORCE: TECHNICAL AND OPERATIONAL ASPECTS
1970 27 p refs *Its* Marine Sci. Affairs Rept. No. 3
Copyright. Avail: Issuing Activity

The technical and operational aspects of the Beaufort scale of wind force are reviewed from two viewpoints, namely the use of a revised scale for the issue of storm warnings, and its use in statistical data needed for research. With regard to the latter, it was recommended the use of the net set of equivalent wind speeds corresponding to the Beaufort scale (proposed by the Commission for Maritime Meteorology) in scientific projects relating to maritime meteorological data, such as the Historical Sea Surface Temperature Data project and the marine climatological summary project. ESRO

N71-30878# Istituto di Fisica dell'Atmosfera, Rome (Italy).
CONTRIBUTION TO THE MOTION FORECASTING OF THUNDERSTORM CELLS [CONTRIBUTO ALLA PREVISIONE DEL MOTO DELLE CELLULE TEMPORALESCHE]
E. Avarello Jun. 1970 66 p refs In ITALIAN; ENGLISH summary
(IFA-TR-32) Avail: NTIS

A method for forecasting the trajectories of thunderstorm cells with relation to the ground is described. It was tested in the Po Valley, Italy, during summer 1967, and is based on the results of the studies carried out in the USA on the correlation between the cloud motion detected by radar and the winds blowing at given atmospheric levels. After a preliminary study on the reflective capacity of the cloud particles, a critical discussion follows on some characteristics of radar echoes. The accurate knowledge of the structure and motion of thunderstorm cells is used for thunderstorm forecasting and active or passive defense against atmospheric calamities. ESRO

N71-30884# Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
WINDS OF ARID AUSTRALIA
Murial Brookfield 1970 61 p refs
(PB-196022; DLR-TP-30) Avail: NTIS

Speed direction, and frequency of the winds of the arid zone are analyzed in detail, and daily and monthly regimes related to the seasonal shift of pressure systems. Data are variable and sometimes infrequent. The relation of the single and twice-daily observations to the 3-hourly observations and to the 24-hr wind run is examined. Procedural and observer bias in recorded observations is discussed. Prevailing winds and strong winds do not have the same pattern. Prevailing winds describe an arc of 90 degrees from southerly in the south to easterly in the north and west, with some seasonal variation, the majority of these winds are of low to medium velocity. Strong winds capable of causing erosion are less predictable and often blow from the opposite direction to prevailing winds. The bivariate distribution is analyzed, and mean winds and persistence calculated. Author (GRA)

N71-30952# France. Direction de la Meteorologie Nationale, Paris.
CLIMATOLOGY OF AIR SPACE OVER TOULOUSE-BLAGNAC [CLIMATOLOGIE DE L'AERODROME DE TOULOUSE-BLAGNAC]
A. Tasson, R. Bubeck, G. Bazillon, and G. Larroucau Feb. 1971 86 p In FRENCH *Its* Monographie No. 80
Avail: NTIS

Meteorological charts presented contain surface temperature, precipitation, visibility, wind direction and wind velocity data. W and SW winds dominate the described area. Transl. by G.G.

N71-31015# National Hurricane Research Lab., Miami, Fla.
HURRICANE GENESIS FROM DISTURBANCES FORMED OVER AFRICA
Toby N. Carlson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p ref Repr. from Mariners Weather Log, v. 13, no. 5 p 197–202 (See N71-30980 18-13)
Avail: SOD $4.25

Despite the presence of rather warm water in the Gulf of Mexico and the western Caribbean, the majority of storms form elsewhere during August and September, and it is rare for a really important storm to generate there at that time of year. From mid-July until late September, the overwhelming majority of tropical storms and hurricanes in the North Atlantic area originate from disturbances that can be traced back to the continent of Africa. The approach of summer brings on a monsoonal flow of moist and unstable air onto the sub-Saharan portion of the African Continent. This flow of air is sufficiently deep in July to sustain vigorous thunderstorm activity between latitudes 10 degrees and 20 degrees N. Author

N71-31016# National Hurricane Research Lab., Miami, Fla.
SOME REMARKS ON AFRICAN DISTURBANCES AND THEIR PROGRESS OVER THE TROPICAL ATLANTIC
Toby N. Carlson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 11 p refs Repr. from Monthly Weather Rev., v. 97, no. 10 p 716–726 Revised (See N71-30980 18-13)
Avail: SOD $4.25

A daily analysis of the 2,000- and 10,000-ft streamlines over West Africa was made for a 3-1/2-mo period beginning in July 1968. With the aid of satellite photographs and auxiliary sea-level pressure data, a total of 33 synoptic scale wave perturbations were observed to move across West Africa and the tropical Atlantic Ocean during this period. Some general features of these disturbances are summarized, including facts on their origin, speed, intensity, distribution of sea-level pressure, appearance on the satellite photographs, and movement over the Atlantic Ocean. The effects of the large-scale circulation and the influence of sea-surface temperatures on the movement and intensity of disturbances are also discussed. Author

N71-31017# National Hurricane Research Lab., Miami, Fla.
SYNOPTIC HISTORIES OF THREE AFRICAN DISTURBANCES THAT DEVELOPED INTO ATLANTIC HURRICANES

Toby N. Carlson *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 21 p refs Repr. from Monthly Weather Rev., v. 97, no. 3 p 256–276 Revised (See N71-30980 18-13)
Avail: SOD $4.25

Surface and upper air (700 mb) analyses along with high-quality satellite photographs are presented for a 2-week period during August and September 1967. These show, in particular, the structure and motion over the continent of Africa of four major wave disturbances, three of which later became Atlantic hurricanes. The evolution of cloudiness and convection and the intensification of the disturbance at low levels over West Africa are examined in detail and related to certain climatological features of the area. Some general characteristics of the disturbances are discussed.
Author

N71-31018# National Hurricane Research Lab., Miami, Fla.
A NOTE ON DRAWING PROBABILITY SECTORS
Peter P. Chase *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 2 p refs Repr. from Monthly Weather Rev., v. 97, no. 8 p 602–603 Revised (See N71-30980 18-13)
Avail: SOD $4.25

The problem of finding the probability that a tropical storm will be in a given area at forecast time is considered graphically. With given bivariate data that have a joint normal distribution, a method is presented for plotting ellipses and rays which partition the data area into annuli and sectors having equal values of integrated probability.
Author

N71-31019# National Hurricane Research Lab., Miami, Fla.
PROJECT STORMFURY
R. Cecil Gentry *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 9 p refs Repr. from WMO Bull. (Switzerland), v. 18, no. 3 p 146–154 (See N71-30980 18-13)
Avail: SOD $4.25

A project to determine to what extent tropical storms can be beneficially altered and the destructive effects reduced is discussed. The reasons for the project, the goals, approaches, and research program proposed for the next two to five years are presented.
Author

N71-31021# National Hurricane Research Lab., Miami, Fla.
NOTE ON THE ACCUMULATED ERROR IN THE NUMERICAL INTEGRATION OF A SIMPLE FORECAST MODEL
Walter James Koss *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 6 p refs Repr. from Monthly Weather Rev., v. 97, no. 12 p 896–901 Revised (See N71-30980 18-13)
Avail: SOD $4.25

A linearized, two-level forecast model with known analytic solution is numerically integrated to examine the behavior of the accumulated error. The results indicate that for linear models numerically integrated with centered differences: (1) the ratio of space increment to disturbance wavelength that yields sufficient accuracy in a reasonable amount of computation real time is on the order of 1/10 to 1/100; (2) the largest time increment consistent with the stability criterion should be used for computation expediency. Computations performed on computers having different word lengths did not yield significant differences in the results for this model integrated out to 7 days.
Author

N71-31022# National Hurricane Research Lab., Miami, Fla.
HURRICANE
Banner I. Miller *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 3 p refs Repr. from McGraw-Hill Yearbook of Sci. and Technol. p 193–196 (See N71-30980 18-13)
Avail: SOD $4.25

The meteorological parameters associated with hurricanes are discussed. Subjects presented are: (1) wind velocity, (2) air circulation, (3) energy exchange, (4) temperature levels, and (5) observations by metecrological satellites.
P.N.F.

N71-31023# National Hurricane Research Lab., Miami, Fla.
EXPERIMENT IN FORECASTING HURRICANE DEVELOPMENT WITH REAL DATA
Banner I. Miller *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 31 p refs (See N71-30980 18-13)
(ESSA-TM-ERLTM-NHRL-85) Avail: SOD $4.25

A multi-level primitive equation model incorporating diabatic and frictional influences has been developed for numerical weather prediction in the tropics. When tested on a limited geographical area in the Western Atlantic, the model appeared capable of predicting the development of a vortex similar to a hurricane. Real data were used and a tropical cyclone did occur. Many typical features of hurricanes, such as the formation of an intense low level vortex, the warming of the upper troposphere, the development of an upper level anti-cyclone, low level inflow, and high level outflow, were forecast.
Author

N71-31024# National Hurricane Research Lab., Miami, Fla.
EXPERIMENTS WITH A NUMERICAL MODEL OF TROPICAL CYCLONE DEVELOPMENT. SOME EFFECTS OF RADIAL RESOLUTION
Stanley L. Rosenthal *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 50 p refs (See N71-30980 18-13)
(ESSA-TM-ERLTM-NHRL-87) Avail: SOD $4.25

Experiments with 10-km and 20-km radial resolution are compared. The 10-km calculation yields a storm with more realistic structure. The 20-km case does not contain a well-defined eye, whereas the 10-km experiment does. Rainfall, kinetic energy production, and efficiency are all larger with 20-km resolution. In both experiments, computational damping is an important component of the kinetic energy budget; however, the total dissipation of kinetic energy (computational plus explicit) is fairly reasonable in comparison to that found in empirical studies. This result provides an estimate of the eddy viscosity coefficients, which would be needed to obtain realistic results with a nondissipative numerical model.
Author

N71-31025# National Hurricane Research Lab., Miami, Fla.
NUMERICAL EXPERIMENTS WITH A MULTILEVEL PRIMITIVE EQUATION MODEL DESIGNED TO SIMULATE THE DEVELOPMENT OF TROPICAL CYCLONES. EXPERIMENT 1
Stanley L. Rosenthal *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 38 p refs (See N71-30980 18-13)
(ESSA-TM-ERLTM-NHRL-82) Avail: SOD $4.25

Nonlinear dynamical models have been shown to be valuable in extending the knowledge of the genesis and maintenance of tropical cyclones. The model assumes the storm to be circularly symmetric and is expressed in z-coordinates. The information levels correspond to pressures in the mean tropical atmosphere of 1015, 900, 700, 500, 300, 200, and 100 mb. The heating function for the cyclone-scale motion is simulated by a convective adjustment of the lapse rate towards a pseudoadiabat representative of ascent from the surface boundary layer. The rate of this adjustment is calibrated so that the vertically integrated heating function is related to the upward flux of water vapor through the surface boundary layer.
Author

N71-31026# National Hurricane Research Lab., Miami, Fla.
PROJECT STORMFURY Annual Report, 1968
In ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 60 p refs Prepared in cooperation with Naval Weather Service Command (See N71-30980 18-13)
Avail: SOD $4.25

The 1968 hurricane season offered both opportunities and frustrations for Project STORMFURY, an interdepartmental program of the Department of Defense (Navy) and the Department of Commerce, Environmental Science Services Administration (ESSA). As in the two previous seasons, nature failed to provide a storm suitable for large field experiments. Yet, overall, 1968 was a very successful year. More progress was made than before in the collection of data needed to confirm that the hurricane clouds could be modified by seeding with freezing nuclei, and significant achievements were made in basic research on hurricane models. The latter has reached the stage where calculations can be made with the models to assist in designing field modification experiments. Author

N71-31027# National Hurricane Research Lab., Miami, Fla.
SOME MEAN HURRICANE SOUNDINGS
Robert C. Sheets *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 13 p refs Repr. from J. Appl. Meteorol., v. 8, no. 1 p 134–146 Revised (See N71-30980 18-13)
Avail: SOD $4.25

Some mean hurricane soundings have been computed from 92 radiosonde observations collected within 100 n mi of the centers of hurricanes. High correlations between various parameters and the sea-level pressures of the observations are shown. The data have been stratified by sea-level pressure, giving more than one mean hurricane sounding. Diurnal variations were investigated and temperature differences that are statistically significant were found to exist in the middle and upper troposphere. In addition, potential buoyancies and available instability energies were computed for some of the mean soundings. Potential and equivalent potential temperatures were found to increase, while the net available instability energy decreased, and the tropopause became higher and colder as the sea-level pressures of the observations decreased. The mean soundings are shown to be conditionally unstable in the lower levels and very stable in the upper troposphere. Author

N71-31028# National Hurricane Research Lab., Miami, Fla.
MEMORABLE HURRICANES OF THE UNITED STATES SINCE 1873
Arnold L. Sugg and Robert L. Carrodus *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 50 p (See N71-30980 18-13)
(ESSA-TM-WBTM-SR-42) Avail: SOD $4.25

Whether or not a hurricane is notable and should be remembered depends upon many things. The selections in this publication are limited to those which have made landfall in the United States or have been near misses. Also, most of them were major, extreme, or great hurricanes; these adjectives usually refer to intensity as determined by the maximum wind or the sea level pressure within the eye. Some hurricanes were great while at sea but reached land with considerably diminished intensity. Connie 1955 is a good example. On the other hand, some which did not have particularly low pressures or high winds were devastating because of flooding. Most notable in this category was Diane 1955. For these reasons the criteria used to determine the memorable hurricanes of this century were not rigid and have been omitted here. Author

N71-31029# National Hurricane Research Lab., Miami, Fla.
HEMISPHERIC CIRCULATION AND ANOMALY PATTERNS OBSERVED WHEN TROPICAL STORMS REACH HURRICANE INTENSITY
Paul J. Herbert and Banner I. Miller *In* ESSA Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 10 p refs (See N71-30980 18-13)
(ESSA-TM-WBTM-SR-46) Avail: SOD $4.25

Composite charts of the average 700-mb circulation and anomaly patterns for those tropical storms which reached hurricane intensity were prepared for the period 1947–1967. The points where tropical cyclones reached hurricane intensity within the designated regions are shown. The average hemispheric circulation and anomaly patterns (units are tens of feet) on D-day (the day that hurricane intensity was reached), and for D-1, and D-2, which are 24 hours and 48 hours prior to the time hurricane status was achieved are presented. Author

N71-31067 California Univ., Los Angeles.
STUDIES OF DIURNALLY PERIODIC BOUNDARY LAYER WINDS
Jan Paegle (Ph.D. Thesis) 1969 165 p
Avail: Univ. Microfilms Order No. 70-14315

Diurnal oscillations of wind in the planetary boundary layer are studied with theoretical models. Emphasis is placed on those theories which are pertinent to the large wind speed oscillation which exists over the Great Plains. The models parameterize eddy stresses with an eddy viscosity formulation. Such a formulation yields exact solutions of the equation of motion with time dependent eddy stress and pressure gradient. The solution of the horizontally uniform problem, with diurnally periodic eddy viscosity fluctuation, reproduces qualitative features of the observed wind oscillation. This oscillation is weakened by the diurnal fluctuation of pressure gradient observed on the Great Plains. The influence of horizontal variation in the large scale flow is investigated by retaining the advective terms in the equation of motion. Periodic higher order solutions are expanded in the Rossby number in the presence of periodic eddy viscosity fluctuation. Dissert. Abstr.

N71-31073*# National Aeronautics and Space Administration, Washington, D.C.
STUDY OF THE INTERACTIONS BETWEEN THE DIFFERENT WIND COMPONENTS IN THE UPPER ATMOSPHERE [ETUDE DES INTERACTIONS ENTRE LES DIFFERENTES COMPOSANTS DU VENT DANS LA HAUTE ATMOSPHERE]
A. Spizzichino Oct. 1970 52 p refs Transl. into ENGLISH from Ann. Geophys. (Paris), v. 25, no. 3, 1969 p 693–720
(NASA-TT-F-13808) Avail: NTIS CSCL 04B

It was generally accepted until now that winds in the mesosphere and lower thermosphere result from the superposition of components - prevailing wind, tides gravity waves - which do not interact. The meteor trails observations made in Garchy clearly confirm the existence of these components, but suggest that they are strongly interaction. A theoretical study of nonlinear effects confirms the importance of these interactions; it shows in particular that the diurnal tide yields energy to gravity waves propagating through the mesosphere. Such a mechanism provides an explanation for many observed properties of tides and gravity waves. This theory of nonlinear effects can be applied to other phenomena occuring in the higher atmosphere. Author

N71-31122 Wisconsin Univ., Madison.
WIND AND TURBULENCE STRUCTURE IN THE BOUNDARY LAYER OVER THE ANTARCTIC PLATEAU
Walter Fred Dabberdt (Ph.D. Thesis) 1969 95 p
Avail: Univ. Microfilms Order No. 70-3507

Two new theories of boundary layer structure are presented and applied in a test case to data from Plateau Station, Antarctica. The extremely long and uniform wind fetch, and steady and stable atmospheric conditions make Plateau a unique and ideal atmospheric laboratory. In addition to large wind-directional changes with height which occur near the surface, several interesting

meteorological phenomena have been observed at the station and tentatively verified as thermal, tidal, and inertial motions. Expressions for the variances and covariances of velocity and temperature fluctuations are given in terms of the length-scales and the mean flow properties. Non-Newtonian stress-strain relationships result which permit eddy fluxes in nonshear regions as well as contergradient fluxes. Lettau's theory is extended to the case of bi-directional mean shear flow and is applied in a test to data from the 32m micrometeorology tower at Plateau. Dissert. Abstr.

N71-31162*# Scientific Translation Service, Santa Barbara, Calif.
DEVELOPMENT OF POLAR STORMS [O RAZVITII POLYARNOY BURI]
O. V. Khorosheva et al Washington NASA Jul. 1970 9 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (USSR), v. 10, no. 2, 1970 p 295–299
(Contract NASw-2035)
(NASA-TT-F-13000) Avail: NTIS CSCL 04B

Based on data regarding the magnetic field and polar aurora, a conclusion is reached about the simultaneous formation and development of a disturbance (polar storm) in the entire polar oval. It is assumed that this result is due to the simultaneous emergence of a soft plasma along the entire boundary of trapped radiation. The conclusions of several researchers regarding a shift in time as the storm passes along different meridians, which is usually regarded as a longitudinal drift of the disturbance source, is assumed to be incorrect. It is believed that the shift in time is due to an incorrect determination of the storm commencement time. Author

N71-31216# Naval Oceanographic Office, Washington, D.C.
STUDYING THE TWO YEAR VARIATION OF ATMOSPHERIC CIRCULATION IN THE NORTHERN HEMISPHERE [KIZUCHENIYU DVUKHLETNEY IZMENCHIVOSTI ATMOSFERNOY TSIRKULYATSII V SEVERNOM POLUSHARII ZEMLI]
B. A. Sleptsov-Shevlevich 1971 16 p refs Transl. into ENGLISH from Problemy Arktiki i Antarktiki (Leningrad), v. 29, 1968 p 36–44
(AD-722840; NOO-Trans-511) Avail: NTIS CSCL 4/1

The observed inequities in yearly variations of atmospheric circulation suggest the existence of another cycle. By means of long-term observations and calculations, the existence of a two-year cycle has been established. It was further found that this pattern of variations is associated with magnetic disturbances and ultimately with variations in solar activity. Author (GRA)

N71-31225# National Oceanic and Atmospheric Administration, Rockville, Md. Environmental Research Labs.
PRELIMINARY VELOCITY DIVERGENCE COMPUTATIONS FOR BOMEX VOLUME BASED ON AIRCRAFT WINDS
Robert W. Reeves Apr. 1971 26 p ref
(NOAA-TM-ERL-BOMAP-5) Avail: NTIS

These preliminary calculations of the horizontal velocity divergence within the Barbados Oceanographic and Meteorological Experiment (BOMEX) volume are based on a limited sample of wind measurements from line integral aircraft night flights around the perimeter of the BOMEX volume at a level of 1,000 ft and stepped soundings at seven different heights at the midpoint of each side of the volume. Results indicate that with careful systematic calibration wind data may be useful in determining divergences. Author

N71-31286# Technical Operations, Inc., Burlington, Mass.
PERFORMANCE TESTING OF THE GROUND-BASED AND SNOWFLAKE DISDROMETER SYSTEMS Final Report, 10 Apr. 1967–13 Jan. 1971
John Boardman Mar. 1971 37 p ref
(Contract F19628-67-C-0286)
(AD-722452; TO-B-71-4; AFCRL-71-0164) Avail: NTIS CSCL 4/2

Instrumentation to record and size naturally occurring aerosol droplets in the 5 to 100 micron diameter size range has been constructed and tested. Two systems were constructed, the ground-based disdrometer and the snowflake disdrometer. In the ground-based disdrometer, an optical Fourier transform of the sample volume is taken. The Fourier transform is sampled electronically and, through a mathematical inversion performed in a computer, the number and size of the fog droplets are computed directly. This type of system is capable of recording fog distributions without the necessity of manually counting and sizing the particles. In the snowflake disdrometer, a pulsed ruby laser illuminates the sample volume, and the laser beam is interfered with a reference beam to form an off-axis Fraunhofer hologram. The short time pulse of the laser stops the motion of the particles and provides an instantaneous sampling periodically over the history of the particles. When reconstructed, the hologram provides results comparable to high resolution photography with vastly improved depths of fields up to 20 inches. Author (GRA)

N71-31287# Texas A&M Research Foundation, College Station.
PREDICTION OF ENVIRONMENTAL PARAMETERS. VOLUME 1: NUMERICAL SIMULATION OF CONVECTION Annual Report, 20 Oct. 1969–20 Oct. 1970
K. C. Brundidge, K. G. Cottrell, D. Djuric, R. A. Perry, and R. T. Song Mar. 1971 195 p refs
(Contract DAAB07-68-C-0073; Proj. Themis)
(AD-722836; A/M-REF-70-17; ECOM-0073-5; AR-3) Avail: NTIS CSCL 4/2

A brief review is given of the numerical procedures that have been developed for the study of convection in the atmosphere. Certain aspects of these procedures such as uniqueness of the finite-difference formulations and numerical stability are discussed in appendices. Results are then given of the application of these procedures to the simulation of dry convection in a deep, two-dimensional region in which motion is initiated by differential heating at the base. A procedure is provided for the simulation of moist convection with a rain stage that could have application to a deep region. A study is presented of the feasibility of yet another method of handling the deep, moist convection problem. Results also are presented of the simulation of convection in a shallow region in the presence of an ambient wind. Author (GRA)

N71-31351*# Texas A&M Univ., College Station.
AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN MOUNTAIN-WAVE CONDITIONS AND CLEAR AIR TURBULENCE ENCOUNTERED BY THE XB-70 AIRPLANE IN THE STRATOSPHERE
Thomas P. Incrocci and James R. Scoggins Washington NASA Jul. 1971 40 p refs
(Grant NGR-44-001-081)
(NASA-CR-1878; H-679) Avail: NTIS CSCL 04A

The data from 38 XB-70 flights conducted over the mountainous regions of the western United States together with rawinsonde data were used to investigate relationships between conditions favorable for mountain waves and clear air turbulence. Profiles for the Scorer parameter and the gradient Richardson number were evaluated from an eight-level model. The Scorer parameter and the gradient Richardson number profiles were computed from the rawinsonde data on those days when the XB-70 flew, and these results compared to the model profiles and related to the reported turbulence. Ascent rate profiles of rawinsonde balloons were analyzed from which the presence of mountain or lee waves was inferred. From the results of this investigation, objective methods were developed for forecasting the occurrence or nonoccurrence of turbulence in the stratosphere due to mountain waves. Author

N71-31411# Texas Univ., Austin. Antennas and Propagation Lab.
RELATIONSHIPS BETWEEN METEOROLOGICAL PARAMETERS, CAT, AND VARIATIONS IN THE INDEX OF REFRACTION MEASURED BY AIRPLANE AND RADAR
James R. Scoggins Dec. 1970 59 p refs
(Grant NSF GA-11462)
(PB-197765; P-45) Avail: NTIS CSCL 04B

An analysis is presented of data collected by airborne instruments and radar, as well as meteorological data to investigate the relationships between distributed gradients of the index of refraction, layer echoes observed by a vertically-pointing radar, turbulence experienced by an aircraft, and synoptic meteorological conditions. Two refractometers were mounted on and below the wing of an airplane a distance of 17.5 centimeters apart, one above the other, in order to measure the vertical gradient of the index of refraction. A bead thermistor was mounted in the vicinity of the two refractometers and was used to measure the vertical profile of temperature. A vertical gust height recorder was used to measure accelerations of the aircraft. The vertical wind profile over Austin was measured with an M-33 radar by tracking a pibal. Other meteorological data were obtained from the synoptic network.
Author (GRA)

N71-31437*# Environmental Data Service, Asheville, N.C. National Climate Center.
ATLANTIC TROPICAL CYCLONE STATISTICS
Harold L. Crutcher Jul. 1971 86 p refs
(NASA Order H-76789)
(NASA-CR-61355) Avail: NTIS

Statistical climatologies of North Atlantic, Caribbean and Gulf of Mexico tropical cyclones are presented. These are stratified according to season, geographical location, and selected time intervals. The statistics are derived by approximating the distribution of tropical cyclone movements by the bivariate normal distribution. The applicability of the bivariate normal and bivariate t distributions in describing the tropical cyclone movements for the above areas is examined by performing Chi-square goodness of fit calculations for fourteen areas. In general, the bivariate t model provides a better fit to the data. For example, at the .05 level of significance, the bivariate t model is rejected in three of the fourteen areas, while the bivariate normal model is rejected in eight areas. Since the bivariate t distribution asymptotically approaches the bivariate normal distribution for large data samples, the difference may be attributed to limited data samples. It is concluded that the bivariate normal distribution, provides a useful model for depicting the movements of tropical cyclones. Tables are provided which may be used to obtain probabilities that an existing tropical cyclone will be within a selected target area at the end of prescribed time intervals. These probabilities likewise may be computed by use of the included Fortran 4 program.
Author

N71-31444# Illinois State Water Survey, Urbana.
A STUDY OF CROP HAIL INSURANCE RECORDS FOR NORTHEASTERN COLORADO WITH RESPECT TO THE DESIGN OF THE NATIONAL HAIL EXPERIMENT
Paul T. Schickedanz and Stanley A. Changnon, Jr. 30 Nov. 1970 99 p refs Prepared for Univ. Corp. for Atmospheric Res.
(Grant NSF C-460)
(PB-197644) Avail: NTIS CSCL 04B

The specific purpose was the evaluation of selected statistical tests and experimental designs related to the daily experimental unit in a single area through use of historical crop-hail loss data. This was accomplished by evaluating the sampling requirements for three basic experimental designs utilizing the daily experimental unit and crop insurance data for crop-damage seasons. These designs included: random-experimental, in which days are randomized over a single target area into seeded and nonseeded days with the nonseeded days being the control; random-historical, in which a random choice is made of days to be seeded over a single target area with the historical record being the control; and continuous-historical in which all the hail days over a single target area are seeded with the historical record being the control. The statistical analyses involved both the nonclassical (sequential) and classical (nonsequential) analyses. The resulting sample sizes were computer for both the 1- and 2-sample tests.
Author (GRA)

N71-31491*# National Aeronautics and Space Administration, Washington, D.C.
THE NEED FOR WEATHER SATELLITE OBSERVATIONS AND JAPAN'S WEATHER SATELLITES [KISHO EISEI KANSOKU NO HITSUYOSEI TO NIHON NO KISHO EISEI]
Dec. 1970 42 p Transl. into ENGLISH from Japanese report
(NASA-TT-F-13825) Avail: NTIS CSCL 04B

Weather satellite organizations and plans, and the construction of a satellite by Japan are discussed; possible advantages and economic savings are listed.
Author

N71-31557# Sandia Corp., Albuquerque, N.Mex.
CLIMATOLOGY OF ATMOSPHERIC DIFFUSION PREDICTION VARIABLES
Hugh W. Church and Robert E. Luna [1971] 18 p refs Sponsored by AEC
(SC-DC-713920) Avail: NTIS

An analysis performed from a set of long term turbulence data is described. The analysis results are presented followed by some simple conclusions suggested from the resulting statistical distributions.
Author

N71-31691# Naval Weapons Center, China Lake, Calif.
GROMET 2: RAINFALL AUGMENTATION IN THE PHILIPPINE ISLANDS
P. St.-Amand, D. W. Reed, T. L. Wright, and S. D. Elliott May 1971 139 p refs
(AD-723815; NWC-TP-5097) Avail: NTIS CSCL 4/2

A severe drought in the Philippine Islands during 1968 and 1969 led the Philippine Government to try cloud seeding as a means of rainfall augmentation. With the help of the United States, a silver iodide seeding project, GROMET II, was conducted over the entire archipelago from the end of April through mid-June 1969. Pyrotechnically generated silver iodide was released in updrafts in growing clouds, and through judicial placement and timing of seeding events individual clouds were organized into larger cloud systems. Rainfall estimated as at least 3 x 10 to the 10th power cubic meters of water fell from seeded clouds. The precise extent of rainfall augmentation resulting from seeding cannot be calculated; nonetheless, rainfall augmentation from tropical cumulus clouds was accomplished in a simple operational manner. Benefits derived, at least in part, from the project included marked improvement in the agriculture, increased sugar production amounting to 43 million U.S. dollars, and augmented crops of rice and corn sufficient to make anticipated importation unnecessary. In addition, local personnel were trained in seeding techniques. Because of the success of GROMET II the Government of the Philippines conducted a similar operation during 1970 and planned another for 1971.
Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N71-30523*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MIDCOURSE AND APPROACH GUIDANCE REQUIREMENTS FOR SIMPLIFIED ONBOARD CONTROL OF MOON TO EARTH TRAJECTORIES

Harold A. Hamer and Katherine G. Johnson Washington Jul. 1971 59 p refs

(NASA-TN-D-6343; L-7662) Avail: NTIS CSCL 17G

Simplified procedures have been developed for midcourse and approach guidance of moon-to-earth trajectories. These procedures require only simple onboard calculations based on optical angular measurements and lead to guidance predictions sufficiently accurate for emergency control of entry angle. An error analysis has shown that with onboard midcourse guidance corrections, an entry corridor of + or − 1 deg can be easily attained regardless of the distance to earth. Without a midcourse correction, this corridor is attainable if the approach guidance correction is delayed to a time within about 8 hours of reaching the earth. The approach guidance procedure can be adapted also to control the trajectory from earth-based line-of-sight measurements. Author

N71-30887# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

INVESTIGATION OF GUIDE-SLOPE INFORMATION RATE REQUIREMENTS FOR A LOW-VISIBILITY AIRCRAFT LANDING

Meyer D. Zuckerman (M.S. Thesis) Mar. 1971 85 p refs

(AD-722655; GE/EE/71-30) Avail: NTIS CSCL 17/7

The glide-slope information rate requirement for a low-visibility Landing approach is studied. The analysis uses a Kalman filter-optimal control combination to simulate the control system of a DC-8. Both noisy and noise free measurements are considered. The results consist of a measure of the probability of missing an approach, as a function of the sample rate of the scanning beam landing guidance. Results indicate a knee at 6 samples per second, with rapid changes in performance in the region from 2-6 samples per second. The position of the knee appears to be insensitive to changes in either deterministic winds or airspeed constraints. Author (GRA)

N71-31119*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.

NON-ORTHOGONAL REDUNDANT CONFIGURATIONS OF SINGLE AXIS STRAPPED DOWN GYROS

A. K. Bejczy *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 107–118 refs (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 17G

Realizing the highly efficient redundancy potential inherent to nonorthogonal emplacements of more than three single-axis strapped-down gyros, and considering practical implementation and performance criteria, 45-deg skew symmetric six- and four-gyro configurations based on the geometry of a regular octahedron are presented. These configurations result in optimum performance, exhibit unique simplicity in gyro output processing requirements, allow high-density packaging, and require reasonable fabrication and test procedures. The redundancy potential of an octahedron six-array gyro configuration is twice as high as that of six gyros in an orthogonal emplacement. Author

N71-31199*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CONTROL MOMENT GYRO FOR SKYLAB

Eugene H. Fikes 19 Mar. 1971 29 p

(NASA-TM-X-64586) Avail: NTIS CSCL 17G

The control moment gyro (CMG) is used in the attitude pointing control system of the Skylab space station. It is primarily an actuator that produces control torques by use of the momentum generated in a large rotating mass. The spinning rotor is supported in a two-gimbal system. The Skylab control system uses three of these two-gimbal CMGs to provide the necessary attitude control torques. The system is redundant because it can function with one CMG out of operation. The design details are presented of the inner gimbal assembly of the CMG. The assembly consists of a sealed inner gimbal, rotor, bearings, drive motors, and monitoring instrumentation. A design goal of 10,000 hours for the operating life of the CMG rotor spin bearings was established and the tests as summarized verify that the goal was achieved. Author

N71-31418# Naval Postgraduate School, Monterey, Calif.

ADAPTIVE ANGLE TRACKING AND CORRELATION FOR AIRBORNE DIRECTION-FINDING

Felix Pfendtner (M.S. Thesis) Mar. 1971 82 p refs

(AD-722564) Avail: NTIS CSCL 17/3

An airborne direction-finding technique capable of handling multiple emitters was developed. An adaptive gate size was introduced in the track correlations based on covariance relations of established tracks and observations. Track files were generated based upon the existence of various target parameters; i.e., frequency, pulse repetition frequency, pulse width and direction-of-arrival. To test the angular resolution capability of the filter, emitters in close proximity to each other with identical electronic characteristics were used in the simulation. Target locations are calculated in a cartesian coordinate system where the sphericity of the earth is taken into account, and with appropriate coordinate transformation computational simplicity is preserved. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N71-30423# Power Reactor and Nuclear Fuel Development Corp., Tokai (Japan).

SOME TECHNIQUES FOR PREPARATION OF CERAMIC FUELS IN PNC, JAPAN

T. Muto, K. Matsumoto, K. Naruki, and S. Suzuki Oct. 1970 28 p refs

(NP-18650; N-841-70-29) Avail: AEC Depository Libraries

Two methods related to orthodox processes for preparation of oxide and carbide pellets are under development. Stress is placed on solution of problems associated with high-grade homogeneity of plutonium and uranium compatible with low density. Data on the oxygen contents of UC pellets from the carbothermic reduction process at various preparation conditions are included. Other techniques concerned with the modified sol-gel processes are also described by which shards, microspheres, and pellets of UO2 and UC are prepared. Author (NSA)

N71-30442# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.

BURNUP: A FORTRAN 4 CODE FOR COMPUTING U, PU, AND Nd MASS SPECTROMETRIC MEASUREMENTS UPDATED TO INCLUDE FAST REACTOR FUELS

B. F. Rider, C. P. Ruiz, J. P. Peterson, Jr., and T. V. McLaughlin Jan. 1970 103 p refs Revised

(Contract AT(04-3)-189)

(GEAP-5355-A-Rev) Avail: NTIS

This code correlates heavy element isotopic analysis with fission product Nd, U, and Pu concentrations in an irradiated U or U + Pu fuel for calculation of burnup (atom percent fission and MWd/MT). Certain reactor parameters including effective neutron absorption cross sections for all U and Pu isotopes,

capture-to-fission ratios for U-235, Pu-239, and Pu-241, a two-group description of the neutron spectrum, the average neutron temperature, the reactor fast fission factor, and the distribution of the sources of fission among the fissionable nuclides are computed from the experimental measurements. A description of the method, the equations used, and instructions for use of the code are included. Author (NSA)

N71-30443# Gulf General Atomic, San Diego, Calif.
MEASUREMENT AND ANALYSIS OF DOPPLER REACTIVITIES IN THE THERMIONIC CRITICAL EXPERIMENT, ASSEMBLY NO. 1
D. A. Sargis, R. A. Moore, and R. Sharp 1 Jul. 1970 68 p refs
(Contract AT(04-3)-167)
(GA-10152) Avail: NTIS

Doppler reactivities were measured for U-238, tantalum, niobium, tungsten, dysprosium oxide, and samarium oxide over a temperature range from 50 to 450 C in the Thermionic Critical Experiment, Assembly No. 1. A new experimental technique was employed in which periodic temperature oscillations of one inch diameter spherical samples were accomplished using a flowing stream of helium gas. Preliminary analysis indicates that the measured Doppler reactivities of all six nuclides are over-predicted by calculational methods typically used in design calculations. Improvements in analysis methods which could reduce the discrepancies are discussed. Author (NSA)

N71-30457# General Electric Co., Sunnyvale, Calif. Breeder Reactor Development Operation.
CENTER TEMPERATURE MEASUREMENTS OF MIXED OXIDE FUEL FROM ZERO TO 3000 MWd/Te
R. R. Asamoto, P. E. Bohaboy, D. W. Sendusky, and A. E. Conti Nov. 1970 50 p refs
(Contract AT(04-3)-189)
(GEAP-13603) Avail: NTIS

The center temperature and the power output of an encapsulated plutonium-uranium oxide fuel pin were directly measured during irradiation in a test reactor. Linear powers up to 15 kW/ft and central temperatures to 2100 C were measured during the experiment which extended to 3000 MWd/Te. The experimental results indicate a decrease in the effective thermal conductivity when the fuel pin is thermally cycled at center temperatures below 1650 C, and a gradual decrease in the heat transfer properties with increasing fuel burnups to 3000 MWd/Te. The first effect is attributed to irradiation damage and thermally induced cracking in the fuel which decreases the effective heat flow. The second effect resulted in increased fuel center temperatures of 100 to 200 C when compared to fuel with essentially zero burnup. This relationship was noted for all linear powers to 15 kW/ft and for fuel center temperatures to 2100 C. Author (NSA)

N71-30458# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.
APPLIED MAGNETOHYDRODYNAMICS. NUMBER 5: MHD-NUCLEAR POWER STATIONS [ANGEWANDTE MAGNETOHYDRODYNAMIK. HEFT 5: MHD-KERNKRAFTWERKE]
T. Bohn, K. Grawatsch, P. Komarek, and G. Noack Aug. 1970 231 p refs In GERMAN
(JUL-688-TP) Avail: AEC Depository Libraries

In an attempt to give a comprehensive representation of the developmental problems facing future magnetohydrodynamic nuclear power plants, an analysis was performed on a number of components. These included: the reactor, MHD generator, transformer, superconducting magnet, heat exchanger, seed material circuit, turbines, and high temperature transmission elements. Following parametric studies of possible design data, specifications could be placed on conventional components, and those requiring special developmental efforts could be identified. It appears that a sufficient technological basis exists for constructing the necessary turbines, heat exchanger, high temperature transmission elements, and electrical transformer. The MHD channel, superconducting magnet, and seed-material circuit need intensive development studies. Technological problems still open are the stability of large superconducting magnets at high magnetic field strengths and the seed material deposition. The biggest development problem lies in the area of high temperature reactors, since an increase in the gas outlet temperature to 2000 C assumes great improvements in coated-particle technology. Circuit optimization and cost studies indicate that the costs of the individual components, with the exception of the reactor, are already well known. Author (NSA)

N71-30459# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
MINOX: A CATALYTIC DEOXYGENATION PROCESS FOR IRRADIATED ORGANIC REACTOR COOLANTS
R. Lopes Cardozo, H. Nordmeyer, H. Langenkamp, and C. Cerutti 18 Dec. 1970 56 p refs
(EUR-4621) Avail: AEC Depository Libraries

Oxygen-containing organic compounds present in organic reactor coolants contribute to the fouling capacity of the coolant. Catalytic hydrodeoxygenation, the MINOX process, is shown to be one of the possibilities to markedly reduce the oxygen content of organic coolants. The process was applied with good success of OM-2, OM-D, and HB-40 coolants. Efficiencies of up to 98% were obtained for the deoxygenation of model compounds of the phenylic, carbonylic, and carboxylic types and some irradiated coolants. In addition, the activity of the process for chlorine removal is very effective. Hydrogenation, cracking, and coke formation, as caused by the catalytic contacts, and the catalyst activation and regeneration possibilities were studied intensively. Author (NSA)

N71-30460# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Radiochemie.
DETERMINATION OF U 232 AND PU 236 IN IRRADIATED NUCLEAR FUEL [BESTIMMUNG VON URAN-232 UND PLUTONIUM-236 IN BESTRAHLTEN KERNBRENNSTOFFEN]
H. Braun and T. Moy Jul. 1970 19 p refs In GERMAN
(KFK-1128; EUR-4320) Avail: AEC Depository Libraries

The alpha-spectrometric determination of U-232 and Pu-236 trace isotopes in irradiated nuclear fuels is described. Interfering plutonium or americium and curium isotopes with similar alpha energies are removed by multiple anion exchange of their nitrate and chloro complexes. Isotopic ratios for U-232/U-238 and Pu-236/Pu-238 samples, with values from 0.4 to 42 $\times$ 10 to the minus 10th power and from 0.2 to 0.000016, respectively, were obtained for two boiling water reactors, one heavy water reactor, two materials testing reactors, and one fast reactor. The suggested upper limit for U-232 content in fuels (0.11 ppm relative to U-235) will be overpassed by the heavy water reactor. The maximal permissible amount of Pu-236 in nuclear power sources for space application (2 ppm relative to Pu-238) will not be reached by the heavy water reactor alone. Author

N71-30474# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
EFFECT OF THE RESONANCE PRODUCTION ON THE NUCLEAR REACTION MECHANISM
A. S. Il'inov and V. D. Toneev 1970 13 p refs In RUSSIAN
(JINR-P2-5548) Avail: AEC Depository Libraries

The resonance production processes are taken into account in the framework of the cascade model. It is shown that variation in the nuclear reaction mechanism, occuring at about 3 to 5 GeV in the region of medium weight nuclei, is explained not by the effect of resonances, produced in the internucleon particle collisions, but by the previously considered effect of the local reduction of the nuclear density in proportion to the cascade development. It is pointed out that the contribution of the many particle collisions is unessential in the energy region T < 30 GeV. Author (NSA)

N71-30475# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
THIN FIELD SHIMMING BY THE MODEL OF THE MAGNETIC SYSTEM FOR PHASOTRON WITH SPACE VARIATION
Yu. G. Alenitskii, S. B. Vorozhtsov, and N. L. Zaplatin 1971 20 p refs In RUSSIAN
(JINR-P9-5590) Avail: AEC Depository Libraries

The results of thin shimming of the magnetic field of the phasotron with space variation are described. Under conditions of the magnetic system model, the accuracy of the field formation of + or − 20 e was obtained. Author (NSA)

N71-30476# Bhabha Atomic Research Centre, Bombay (India). Metallurgy Div.
LITERATURE SURVEY ON PLUTONIUM BEARING CARBIDE FUELS PROPERTIES AND POTENTIALS OF URANIUM-PLUTONIUM CARBIDES AS FAST REACTOR FUELS: A REVIEW
B. D. Zope and V. K. Moorthy 1970 50 p refs
(BARC-1-61) Avail: AEC Depository Libraries

The properties and potential of uranium-plutonium carbides as fast reactor fuels are studied and the superiority of carbide fuels over metal and oxide fuels is established. The studies include various aspects such as phase diagrams, compounds, preparation, fabrication and manufacture, properties, compatibility with cladding materials, irradiation behavior and gas release. The potential of UC-PuC for sodium cooled fast reactors is discussed. An analytical study of carbide fuel element in the Enrico Fermi Fast Breeder Reactor was made and heat transfer, nuclear and preliminary cost studies show that carbide fuels offer the promise of significant reduction in the fuel cycle cost of fast breeder power reactors. The economic potential of high performance (U,Pu) carbide in an LMFBR is also discussed. NSA

N71-30477# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Reaktorphysik.
THE QUALITATIVE SAFEGUARD MEASURES IN THE SPHERE OF CONTROL OF FISSIONABLE MATERIAL [DIE QUALITATIVEN UEBERWACHUNGSMABNAHMEN IM RAHMEN DER SPALTSTOFFFLUBKONTROLLE]
A. Hagen, D. Nentwich, H. E. Otto, and D. Gupta Oct. 1970 30 p refs In GERMAN; ENGLISH summary
(KFK-1108) Avail: AEC Depository Libraries

Qualitative safeguard measures are categorized. At the same time the efficiency of these measures is compared with that of the quantitative measures. Furthermore, some typical examples of qualitative measures which appear promising in their potential of development are described. The fields of application for these measures in the nuclear fuel cycle, as seen today, are indicated. Author (NSA)

N71-30481# Atomic Energy Commission Research Establishment, Riso (Denmark).
DEVELOPMENT AND VERIFICATION OF NUCLEAR CALCULATION METHODS FOR LIGHT-WATER REACTORS
K. E. Lindstroem Jensen Dec. 1970 161 p refs
(RISO-235) Avail: AEC Depository Libraries

The calculation methods for kinetics of light-water reactors developed in the TWODIM system of programs are described. Several methods for unit cell, assembly and over-all reactor burnup investigations are available. The true irradiation history may thus be followed with respect to local flux spectrum and power changes where the leakage influence from the surrounding lattice on the local unit cell calculation is accounted for. A new accurate method is introduced for the control rod treatment. The applicability of the various computation methods is verified by means of a great number of detailed calculations that are compared with available measurements. Author (NSA)

N71-30482# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.
CERAMIC FUEL STUDY. THE EFFECT OF THE O/U RATIO ON URANIUM DIOXIDE SINTERING Progress Report, 1 Jan.–1 Dec. 1969 [STUDIUM KERAMICKYCH PALIV. ULCHE POMORU O/U PRI SLINOVANI KYSLICNIKU URANICITEHO ZPRAVA O POKROCICH VYZKUMNOHO UKOLU ZA OBDOBI, 1 Jan.–1 Dec. 1969]
J. Becvar and A. Klimova [1970] 20 p refs In CZECHOSLOVAKIAN
(UJV-2370.M) Avail: AEC Depository Libraries

A study was performed on the sintering of UO2 prepared from ammonium polyuranate by hydrogen reduction at temperatures of 500 to 900 C. The UO2 was sintered under hydrogen at temperatures of 1450, 1550, and 1650 C. The density of the pellets, usually exceeding 95% of the theoretical value, was not affected significantly by the O/U ratio, but pellets made of material with an O/U ratio of from 2.08 to 2.20 were considerably more homogeneous. On sintering under inert gases an activating effect of hyperstoichiometric oxygen was observed. However, owing to the difficulty of excess oxygen removal from sintered pellets, a large-scale application of this technique was problematic. Heating the pellets in Ar and substitution of Ar for hydrogen at temperatures of 1000 and 1350 C resulted in a cracking of the pellets. NSA

N71-30486# Argonne National Lab., Ill.
PROTOTYPE ANALOG REACTIVITY METER FOR EBR-2
J. R. Karvinen, R. W. Hyndman, R. A. Call, and C. C. Price Feb. 1971 24 p refs
(Contract W-31-109-eng-38)
(ANL-7700) Avail: NTIS

A prototype analog reactivity meter was developed for Experimental Breeder Reactor 2 (EBR-2). Accepting an amplified signal that is proportional to reactor power, the meter uses integrated circuitry to manipulate the incoming signal according to point-kinetic reactor theory and produces a direct readout of reactivity in inhours. This meter, which has been used to monitor all EBR-2 operations since July 1969, obtains the first derivative of the neutron flux using a filtered differentiator and incorporates six delayed-neutron groups using closed-loop dynamics. The meter has a frequency response from dc to 40 Hz and can measure reactivity changes with an accuracy of 0.1 Ih. Author (NSA)

N71-30488# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
DEVELOPMENT OF COATED FUEL PARTICLES. REPORT ON THE ROLE OF GERMAN WORK ON THE DEVELOPMENT OF FUEL ELEMENTS FOR HIGH TEMPERATURE REACTORS [ENTWICKLUNG VON BESCHICHTETEN BRENNSTOFFTEILCHEN. BEITRAEGE DER KFA IM RAHMEN DER DEUTSCHEN ARBEITEN ZUR ENTWICKLUNG VON BRENNELEMENTEN FUER HOCHTEMPERATURREAKTOREN]
H. Nickel Aug. 1970 44 p refs In GERMAN
(JUL-687-RW) Avail: AEC Depository Libraries

Studies on coated breeder reactor fuel particles are described. Methods for the preparation of fuel particles were investigated. The techniques for the coating of fuel particles with pyrocarbon and SiC of defined structure and properties were studied. The importance of prismatic laminated bodies in the high-temperature reactor fuel elements was discussed. The irradiation of model particles showed the radiation damage to the pyrocarbon by fast neutrons. The amoeba effect was also considered. NSA

N71-30487# Gt. Brit. National Inst. for Research in Nuclear Science, Chilton. High Energy Lab.
NIMROD OPERATION AND DEVELOPMENT Quarterly Report, 1 Oct.–31 Dec. 1970

D. E. Gray, ed. Jan. 1971 14 p refs
(RHEL/R-211) Avail: AEC Depository Libraries

The Nimrod beam was on for high energy research for 92.2% of scheduled operating time. Three experiments were completed and six continued through in the quarter. Some notes on the new pion 11 (radiobiological) beam line are given. Author (NSA)

N71-30488# Gt. Brit. National Inst. for Research in Nuclear Science, Chilton. High Energy Lab.
NIMROD OPERATION AND DEVELOPMENT Quarterly Report, 1 Jul. – 30 Sep. 1970
D. E. Gray, ed. Dec. 1970 13 p
(RHEL/R-210) Avail: AEC Depository Libraries

The Nimrod beam was on for high energy physics research for 89.4% of scheduled operating time. One experiment was completed, six continued through, and one commenced in the quarter. Some notes are given on a time structure analyzer used for monitoring high frequency components of beam structure. NSA

N71-30489# Gt. Brit. National Inst. for Research in Nuclear Science, Chilton. NIMROD Design Group.
SOME ENGINEERING ASPECTS OF THE NIMROD THIN SEPTUM EXTRACTION SYSTEMS AND COMPONENTS
D. R. Moore Sep. 1970 85 p
(RHEL/R-209) Avail: AEC Depository Libraries

The plunging mechanisms, magnets, and target mechanisms used with the Nimrod extraction systems are described. Experience over the past years has shown the obvious advantages to operation and maintenance crews of designing for reliability, easy access, modular construction, and quick interchange of components. The extraction system requirements and design criteria are stated. Author (NSA)

N71-30503# Centro Informazioni Studi Esperienze, Milan (Italy).
EXPERIMENTAL IRRADIATION OF METALLIC URANIUM FUEL ELEMENTS IN THE HALDEN HBWR REACTOR [ESPERIENZE DI IRRAGGIAMENTO DI ELEMENTI DI COMBUSTIBILE AD URANIO METALLICO NEL REATTORE HBWR DI HALDEN]
G. Morandi and A. Scaroni Aug. 1969 88 p refs In ITALIAN
(Contract EURATOM-008.65.1-NTRI)
(CISE-R-278; TR-73) Avail: AEC Depository Libraries

The first phase of the irradiation experiments of two metallic uranium fuel elements, made within the framework of the CIRENE program, is described. The experiments were conducted in the HBWR reactor at Halden in Norway. The experimental equipment is described and data on the preirradiation characteristics of the fuel elements and the data developed from the experiments are reported. At the end of the first phase, the mean burnup was 1130 and 1568 MWd/ton U (maximum equal burn-up at 1503 and 1991 MWd/ton U). Author (NSA)

N71-30504# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
THE VARIATION IN SENSITIVITY OF TLD LiF EXTRUDED RODS WHEN ANNEALED AT 500 C
A. Tobias Jan. 1971 13 p refs
(RD/B/N-1872) Avail: AEC Depository Libraries

A study of the variation of the sensitivities of individual TLD-LiF dosimeter rods was carried out to assess their use for accurate measurements. It was found that the optimum annealing temperature for TLD-LiF powder of 500 C when used with TLD LiF rods caused a reduction in sensitivity which could not be removed by annealing at 400 C. Annealing the rods at 400 C produced only a few percent variation in sensitivity from the mean value. Author (NSA)

N71-30529# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.
U(C,N) AS HIGH EFFICIENCY FUEL: PREPARATION AND IRRADIATION PROPERTIES [U(C,N) ALS HOCHLEISTUNGSBRENNSTOFF: HERSTELLUNG UND BESTRAHLUNGSEIGENSCHAFTEN]
I. Ali Khan, A. Naoumidis, and G. Pott Oct. 1970 17 p refs In GERMAN Presented at the Intern. Meeting on Fast Reactor Fuel and Fuel Elem., Karlsruhe, Germany, 28 – 30 Sep. 1970
(JUL-703-RW) Avail: AEC Depository Libraries

These studies included the preparation of the carbon nitrides and their processing to pellets through hot pressing, the compatibility of these mixed crystals with some steels, and a limited irradiation program to obtain data on the inpile behavior of this fuel under high power. The swelling behavior, the fission gas release, the fuel stability, and the compatibility with the cladding relative to the composition of the fuel and the burnup were studied in detail. Author (NSA)

N71-30529# Atomic Energy Commission, Washington, D.C.
EXPERIMENTAL RESEARCH ON MODEL TEMPERATURE CONDITIONS OF OPERATION OF FUEL ELEMENTS OF THE BOR-60 REACTOR
V. I. Subbotin et al [1971] 22 p refs Transl. into ENGLISH from Russian report
(AEC-tr-7221) Avail: NTIS

The results are presented of the experimental investigations on thermal models of the core of the BOR reactor, and of temperature fields and the thermal emission of fuel elements in the BOR reactor. An evaluation is made of the temperature nonuniformities of essential side and corner fuel elements of the assembly. Author (NSA)

N71-30621# Junta de Energia Nuclear, Sacavem (Portugal). Laboratorio de Fisica e Engenharia Nucleares.
STUDY OF THE DYNAMIC BEHAVIOR OF A NUCLEAR REACTOR AFTER AN ABRUPT CHANGE IN REACTIVITY [ESTUDO DO COMPORTAMENTO DINAMICO DE UM REACTOR NUCLEAR APOS UMA ALTERACAO BRUSCA DE REACTIVIDADE]
Jaime M. Costa Oliveira 1969 30 p refs In PORTUGUESE
(LFEN-NI-47a) Avail: AEC Depository Libraries

The solutions of the kinetic equations of a reactor without reflector, subjected to an abrupt change in reactivity, are obtained by means of the Laplace transformations, assuming that the reactor is in a stationary and critical state at the moment at which the change occurs. The concentrations of the delayed neutron precursors and the density of the neutrons are presented in the form of exponential sums in which the coefficient of the time variable in the exponent of each term is a root of the Nordheim equation and in which the coefficient of each term is proportional to the value of the residue corresponding to this root. The results of the calculation of the variation of the neutron density after an abrupt introduction of reactivity into the core of the RPI are presented. The effect of the eventual modification of the values of Lambda and beta sub e on the results is also studied. Some recommendations of an experimental nature are made. Author (NSA)

N71-30634# Central Electricity Generating Board, Bristol (England). Berkeley Nuclear Labs.
METHODS OF GAMMA RAY SPECTROMETRY APPLICABLE TO SHIELDING MEASUREMENTS
A. J. Fraser Dec. 1970 19 p
(RD/B/N-1863; RPC/Sh/P-(70)8) Avail: AEC Depository Libraries

A gamma ray spectrometer is required for use around nuclear power stations in areas of high flux. A satisfactory detector must be suitable for site work, i.e., have known resolution and accuracy and be neutron insensitive. From a range of detectors investigated, an organic liquid scintillator was selected and initial measurements

indicate that it will function in gamma fields which give doses of about 2 R/hr. Author (NSA)

N71-30847# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

COOLANT BLOWDOWN STUDIES OF A REACTOR SIMULATOR VESSEL CONTAINING A PERFORATED SIEVE PLATE SEPARATOR

R. T. Allemann, A. J. McElfresh, A. S. Neuls, W. C. Townsend, N. P. Wilburn et al Feb. 1971 284 p refs

(Contract AT(45-1)-1830)

(BNWL-1463) Avail: NTIS

Safety studies simulating pressurized water and boiling water reactor hypothetical piping breaks were conducted in a 150 cu ft vessel. High pressure water blowdowns (up to 2100 psi, 600 F) were studied using orifice diameters of 0.9 to 5.2 in. at three different nozzle locations on the vessel. Internal pressure and temperature, liquid level, thrust reaction forces, weight of fluid in the vessel, and movement of the sieve plate separator during the flow transient were measured and the data is presented. Anomalous depressurization behavior was shown to be the result of dissolved nitrogen and instrument configuration. The forces on the plate inferred from the plate deflection were less than predicted. The nozzle length had little effect on the mass flux during blowdown. Comparisons were made with subcooled depressurization predictions for both the subcooled and saturated regimes. The predictions showed good agreement where realistic orifice pressure functions and orifice flow coefficients were used. Author (NSA)

N71-30821# Junta de Energia Nuclear, Sacavem (Portugal). Lab. de Fisica e Engenharia Nucleares.

NUMERICAL TREATMENT OF THE RESULTS OF AN EXPERIMENTAL ROD DROP IN A NUCLEAR REACTOR [TRATAMENTO NUMERICO DOS RESULTADOS DE UMA EXPERIENCIA DE QUEDA DE BARRAS NUM REACTOR NUCLEAR]

Jaime M. Costa Oliveira 1969 8 p refs In PORTUGUESE

(LFEN-NI.49(Alpha)) Avail: AEC Depository Libraries

The sub-program of the LFEN-FR6 for the numerical calculation of the results of an experimental rod drop in a nuclear reactor are presented. The data input is described. NSA

N71-30822# Kernforschungsanlage, Juelich (West Germany). Zentralabteilung Forschungsreaktoren.

THE INFLOW AND HEAT ENGINEERING INTERPRETATION OF THE FRJ-1 REACTOR CORE FOR THE 10 MW OPERATION [DIE STROEMUNGS UND WAERMETECHNISCHE AUSLEGUNG DES FRJ-1 REAKTORKERNS FUER DEN 10 MW BETRIEB]

W. Katscher Aug. 1970 74 p refs In GERMAN

(JUL-693-RE) Avail: AEC Depository Libraries

Inflow and heat engineering studies on the new fuel and absorber elements of the MTR type, which were carried out in reference to the future operation of the swimming pool reactor FRJ-1 with a power of 10 MW, are described. The inflow measurements in the fuel element of the central core region of the research reactor extended to the measurement of the pressure loss/through-put characteristics, determination of the coolant through-put distribution on the individual gaps of the fuel and absorber elements, determination of the velocity profile in the external coolant gap of the standard fuel element, and velocity measurements in the gap between the fuel elements. The new fuel element concept contains external fuel plates. The knowledge of the inflow processes in the gap between the fuel elements is essential for the evaluation of the heat engineering design. The measurements showed that the reactor core, compared with lateral inflow through simple structures, is not sufficiently cooled. A cladding of the core with an aluminum case was proposed. Measurements in a 5 × 2 fuel-element core clad with Al confirmed the utility of this precaution. Author (NSA)

N71-30853# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

THERMOSIPHON LOOPS FOR CORROSION MEASUREMENTS IN HIGH TEMPERATURE TERPHENYLS

G. C. Imarisio 1971 28 p

(EUR-4620e) Avail: AEC Depository Libraries; EUR F.Fr. 5.60

Eight thermosiphon loops were designed and built for corrosion measurements in high temperature terphenyls. The general design criteria are described as well as some peculiar features of the plant. Continuous operation of the loops during about 20,000 hrs has shown that these loops are well suited for the long term corrosion measurements which require a trouble free operation. The loops are provided with control of the atmosphere over the terphenyl and of its composition. The water content of the circulating liquid is controllable and constant with + or − 10% at the 100 ppm level; the temperature is held within + or − 1 C around 400 C. Author

N71-30862# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorwerkstoffe.

APPARATUS FOR MEASUREMENT OF THE RELEASE OF FISSION GASES AND OTHER FISSION PRODUCTS BY HEATING [APPARATUR ZUR MESSUNG DER FREISETZUNG VON SPALTGASEN UND ANDERER SPALTPRODUKTE DURCH AUSHEIZEN]

Karl Alfred Stradal Oct. 1970 64 p refs In GERMAN

(JUL-707-RW) Avail: AEC Depository Libraries

In gas-cooled high temperature reactors, the fuel is generally in the form of small particles which are coated, for example, with pyrolytic carbon. The coating has the task of keeping the fission products from the coolant gas. Within the framework of the development of these layered particles, the coating integrity must be tested. In addition to other possibilities the heating test after irradiation in the reactor can be used. An apparatus is described which was developed and introduced to determine with very high sensitivity the release of fission gases and nonvolatile fission products. Author (NSA)

N71-30906# Kernforschungszentrum, Karlsruhe (West Germany).

FAST BREEDER PROJECT Quarterly Report, 1970 [PROJEKT SCHNELLER BRUETER: VIERTELJAHRESBERICHT 1970]

Nov. 1970 150 p refs In GERMAN

(KFK-1270/3; EUR-4571) Avail: AEC Depository Libraries

The work done on fuel rod design, preparation and irradiation of fuel rods, reactor and rod material development and study, corrosion studies, coolant analyses, fuel cycles, reactor theory, safety of fast reactors, instrumentation and signal propagation for core monitoring, consequences of reactor incidents on the environment and activity release, sodium technology studies, thermodynamic and hydrodynamic research in gas and steam, reactor design studies, and the fast high flux test reactor FR 3 is reported in detail. NSA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N71-30414# Tokyo Univ. (Japan). Inst. for Nuclear Study.

ANALOG MODEL OF THE MAGNET FOR A BUBBLE CHAMBER

Kuninari Endo Aug. 1970 23 p refs In JAPANESE

(SJC-T-70-2) Avail: AEC Depository Libraries

Some experimental study on the magnetic field of the magnet

for a bubble chamber was performed, since the effective region of the bubble chamber depends on the uniformity of the magnetic field. The shape of the magnet pole and the current distribution of the magnet coil were investigated. Two analog models (electrolytic cells) of the magnet were constructed to measure the two-dimensional and three-dimensional distribution of magnetic flux density. The magnet poles of two shapes were used, that is, 90 deg and 45 deg pole. The radial distribution of the flux density of the three dimensional analog model was in agreement with that of a small model magnet, and the distribution in Z direction was twice as large. There was no difference between the flux density of the 45 deg and the 90 deg poles in the two dimensional model. Some difference was observed between the field distribution of the 90 deg poles with taper and without taper. NSA

N71-30415# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
GENERAL PROBLEMS OF FIELD THEORY
K. Hepp 1970 30 p refs
(ITF-70-107-E) Avail: AEC Depository Libraries

Recent results in quantum field theory in perturbation theory and in axiomatic quantum field theory are reviewed. NSA

N71-30419# Akademiya Nauk URSR, Kharkov. Fiziko-Teknischeskii Inst.
EFFECT OF TOROIDAL STATE ON VACUUM MAGNETIC CONFIGURATION OF A VINTOTRON (HELICOTRON)
V. F. Aleksin, V. V. Nemov, and A. A. Shishkin 1970 19 p refs In RUSSIAN
(KHFTI-70-25) Avail: AEC Depository Libraries

The magnetic configuration of a toroidal helicotron was studied. In the Mercier system of coordinates, linked with the helical line on the torus, expressions were developed for the components of a magnetic field. Equations were solved for the force lines. It is shown that the force lines near the magnetic axis form closed magnetic surfaces and the values of the separation of the toroidal helicotron's magnetic axis from the position of the straight (uniflow) helicotron are given for the elliptical surfaces and for those parameters of the helicotron when in the direct helicotron the surfaces are circular. Author (NSA)

N71-30424# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Atomnoi Energii.
METHOD OF EXPERIMENTAL DETERMINATION OF DEPTH OF MAGNETIC WELL AND STUDY OF PROPERTIES OF SYSTEM WITH MINIMUM B [METODIKA EKSPERIMENTALNOGO OPREDELENIYA GLUBINY MAGNITNOI YAMY I IZUCHENIYA SVOISTV SISTEMY S MINIMUMOM B]
V. M. Glagolev, Yu. V. Skosyrev and A. A. Shmarin 1970 18 p refs In RUSSIAN
(IAE-1967) Avail: AEC Depository Libraries

An experimental method is described for determination of the value of the minimum B in magnetic systems having sectors with known distribution of magnetic field. Results are presented from measurement of the depth of the magnetic well in configurations containing a homogeneous longitudinal field and transverse fields of the first, second, and third azimuthal harmonics. The mean value of the magnetic well as Delta H/H = (3 + or - 1.2)%. NSA

N71-30484# Scientific Research Inst. of Electro-Physical Apparatus, Leningrad (USSR).
SEXTUPOLE LENSES WITH DIRECT NONLINEARITY IN A SLOW EJECTION SYSTEM
A. V. Galchuk and Yu. P. Sivkov 1970 10 p refs In RUSSIAN; ENGLISH summary
(NP-18594) Avail: AEC Depository Libraries

Application of sextupole lenses with considerable drop-off of the field on the aperture edge in the slow ejection system has been considered. Calculations have shown that application of these lenses allows to decrease the swing amplitude and to improve slightly the emittance of the external beam as well as to reduce the total length of lenses on the ring. Author (NSA)

N71-30473# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Experimentelle Kernphysik.
DEPENDENCE OF SURFACE RESISTANCE ON FIELD LEVEL IN PURE SUPERCONDUCTORS
J. Halbritter Dec. 1970 20 p refs
(NP-18742) Avail: AEC Depository Libraries

As in normal conductors, at plane surfaces of superconductors a magnetic field parallel to the surface is accompanied with states localized in the penetration region of the magnetic field H. In cavities the RF magnetic field is parallel to the surface and will, therefore, induce these surface states in addition to changes of other states caused by H. These changes yield a strange dependence of RF surface resistance R sub s(H) on field level: for a certain field level H sub R-enhanced RF absorption occurs due to the energy shift of the surface states, yielding a resonance peak in the surface resistance. With further increasing H > H sub R, the surface resistance decreases and drops even below the value at H approximately 0 due to the changed excitation spectrum. These observed structures in R sub s(H) of massive niobium cavities indicate a nearly perfect niobium surface. Author (NSA)

N71-30500# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
RESONANT DEPOLARIZATION OF THE ELECTRON BEAM UNDERGOING ACCELERATION IN THE SYNCHROTRON
A. Turrin Dec. 1970 13 p refs Presented at Meeting on Electronsynchrotron, Frascati, Italy, 5 Nov. 1970
(LNF-70/52; Conf-701121-1) Avail: AEC Depository Libraries

The possibility of accelerating vertically polarized electron beams to high energies in the Frascati Synchrotron is pointed out. Author (NSA)

N71-30637# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering.
RESISTIVITY MINIMUM IN FERROMAGNETS
Ryusuke Hasegawa Mar. 1971 5 p refs
(Contract AT(04-3)-822)
(OALT-822-25; Rept-20) Avail: NTIS

An approximate calculation of the contribution of the electron-magnon interaction to the temperature dependence of the electrical resistivity is given. The result calculated in the order of (j sub sd) cubed (where J sub sd is the s-d exchange integral) leads to a term proportional to InT. When combined with the T squared term, which is obtained in the calculation to the order of (J sub sd) squared, the present result gives a resistivity minimum if J sub sd is negative. Author

N71-30660# Bendix Corp., Kansas City, Mo.
OPTOELECTRONIC MEASUREMENT Final Report
R. M. Howard Feb. 1971 25 p refs
(Contract AT(29-1)-613)
(BDX-613-276) Avail: NTIS

The problems encountered with and the modifications made to the semiconductor laser system to test photodiodes are discussed. The criteria for the various measurements made with this system are given, and the test results are presented in tables, graphs, and photographs. Author

N71-30635# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
CRITICAL BEHAVIOR IN THE LINEAR RESPONSE OF A SUPERCONDUCTOR TO A STATIC MAGNETIC FIELD

F. de Pasquale and E. Tabet 2 Jan. 1970 31 p refs
(ISS-70/1) Avail: AEC Depository Libraries

The order-parameter fluctuations are studied in the framework of the microscopic theory of superconductivity, both for T > T sub c and for T < T sub c. The critical behavior of the local superfluid density rho sub s(k) is investigated, and the continuity of rho sub s in the critical region is explicitly shown. Long range correlations in the order parameter–order parameter correlation function T(q) are found below T sub c. The link of the behavior of T(q) with the Goldstone mode induced by the gauge symmetry breakdown and the role played by long range correlations in ensuring continuity in the critical region are discussed. Agreement with the phenomenological theory and with some previous results for T > T sub c is found. Author (NSA)

N71-30686# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.

COMPUTATION OF RENORMALIZED RADIATIVE CORRECTIONS: APPLICATION TO THE SCALAR THEORY LAMBDA (PHI CUBED) [CALCULS DE CORRECTIONS RADIATIVES RENORMALISEES PAR ORDINATEUR: APPLICATIONS A LA THEORIE SCALAIRE LAMBDA (PHI CUBED)]

Michel Perrottet (Ph.D. Thesis – Aix-Marseilles Univ.) 1970 87 p refs In FRENCH
(CNRS-CPT-70-P-318) Avail: AEC Depository Libraries

Programs for calculating the Feynman diagrams of a scalar field interacting with itself for any order in the perturbation series are presented. The interaction term used is lambda phi squared psi where lambda is coupling constant, and phi and psi are the two interacting fields. The FRENEY program was written in FORTRAN and uses combinatorial analysis to obtain all the nonrenormalized diagrams associated with a given order in the perturbation series of a predetermined physical process. The ACOFIS program used for calculating the diagrams (the Feynman parametrization) was written in LISP language. The program is not concerned with algebraic calculations. The LISP programs were used with IBM 360-67 and the FORTRAN program with UNIVAC 1108. Author (NSA)

N71-30687# Reactor Group, United Kingdom Atomic Energy Authority, Sellafield (England).

VELOCITY OF SOUND IN CARBON DIOXIDE AT LOW TEMPERATURES

A. C. Rapier 1970 15 p refs
(TRG-2070) Avail: AEC Depository Libraries; HMSO 2s; BIS $0.40

The investigation of the generation of noise and its effects on components in reactor circuits requires a knowledge of the velocity of sound in carbon dioxide at relatively low temperatures where there are significant deviations from the ideal gas law and for which no tabulated data are available. An equation of state for temperatures in the range 0 to 100 C is found which fits the experimental data, and from this the velocity of sound is deduced. Author (NSA)

N71-30688# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.

NEUTRON-OPTICAL PROPERTIES OF THE SIX-POLE MAGNET CONSIDERING THE EFFECT OF GRAVITY

I. M. Matora 1970 8 p ref In RUSSIAN
(JINR-P3-5537) Avail: AEC Depository Libraries

It is shown that the optical axis of a straight horizontal six-pole magnet in the Earth's gravitational field is displaced for the forcused neutrons downwards from the six-pole magnet axis by the distance (independent of the neutron energy) at which the weight of a neutron is equalized by the effect of the inhomogeneous magnetic field on its magnetic moment. This circumstance can be effectively used in constructing neutron optical systems that have no points in the working area of the field where the magnetic field is small. Author (NSA)

N71-30707*# National Aeronautics and Space Administration, Washington, D.C.

CRYOGENICS: A COMPILATION

1970 15 p
(NASA-SP-5932(01)) Avail: NTIS CSCL 20L

A compilation of technical applications in cryogenic technology is presented. Applications range from cyrogenically cooled masers to a method of expediting pipe repair by freezing outer boundary sections. Materials and devices are discussed in terms of durability and reliability under extreme temperature stress. E.H.W.

N71-30735# Atomic Energy of Canada, Ltd., Chalk River, (Ontario).

PLANAR FORMATION OF AN ELECTRON RING IN A STATIC MAGNETIC FIELD

G. E. Lee-Whiting Dec. 1970 56 p
(AECL-3779) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.50

Conditions are established under which a charged particle moving in the transverse symmetry plane of an axially symmetric static magnetic field will follow a spiral trajectory which approaches a circle asymptotically. An approximate expression is derived for the time interval which a particle having initial conditions slightly different from those for the spiral trajectory spends near the limiting circle. This expression is used to estimate the steady state mean particle-density in a ring about the limiting circle resulting from the injection of a beam. In order to provide an indication of the onset of collective effects the ratio of the mean density in the ring to the density in the injected beam and the ratio of the maximum magnetic field generated by the ring to the guide field are estimated. Tolerances on the beam-defining parameters are calculated by requiring that all particles spend some time in the ring. It is concluded that for reasonable tolerances on the beam a device of this type cannot generate a ring in which the mean particle density is substantially greater than the density in the incident beam. Author (NSA)

N71-30737# Illinois Univ., Urbana.

MAGNETIC HYPERFINE FIELDS IN SOLID SOLUTIONS OF MANGANESE ANTIMONIDE AND CHROMIUM ANTIMONIDE

Patrice Jean-Claude Vernes (Ph.D. Thesis) Jun. 1971 114 p refs
(Contract AT(11-1)-1198)
(COO-1198-800) Avail: NTIS

Hyperfine fields at magnetic and nonmagnetic lattice sites were measured in samples of the magnetic compound Mn(1-x)Cr(X)Sb (0 < or = to X < or = to 1) using the Mn-55 zero-field NMR at room temperature and the Sb-121 Mossbauer effect resonance at 4.2 K. The NMR measurements were made on three samples up to X = .05 and lead to values of the hyperfine fields at the Mn site which decreased slowly at the rate of −1.66 kG/atomic % Cr from the pure MnSb value of 218.72 kG. Eleven samples covering the whole compositional range from ferromagnetic MnSb to antiferromagnetic CrSb were used for the Mossbauer effect work. The value of the field for pure MnSb was 396.2 kG when the electric quadrupole interaction was included in the computer fitting of the spectrum. The effect was related on a microscopic scale to the increase in the strength of the negative interband mixing contribution to the s-d scattering process as compared to the nearly constant positive Coulomb exchange term. Author

N71-30738*# Radio Corp. of America, Princeton, N.J.

INVESTIGATION OF LINE-OF-SIGHT PROPAGATION IN DENSE ATMOSPHERE, PHASE 2 Final Report, Jun. 1970–Feb. 1971

J. W. Davenport and D. A. De Wolf Jul. 1971 60 p refs
(Contract NAS2-5310)
(NASA-CR-114288) Avail: NTIS CSCL 20F

The investigation of the effect of Jupiter's atmosphere upon communications in the 1 to 10 GHz frequency band was continued. Microwave absorption and decimetric radio noise have been singled out for special attention. Laboratory measurements of the absorption in simulated Jovian atmospheres have been carried out at S-band. These were integrated with recent X-band data to yield a complete picture of the absorption given a model atmosphere. It was concluded that: (1) Absorption losses in Jupiter's supra-cloud atmosphere at S- and X-band frequencies are very important, and these losses are due to nearly-saturated ammonia at the prevalent pressures and they increase rapidly as the altitude decreases toward the cloud layer. (2) Jovian decimetric noise in the region of 2 GHz and higher frequencies can be ignored by space probes with isotropic antennas. (3) Turbulence-induced signal fading in the Venusian atmosphere exceeds 15 dB at 2 GHz and higher frequencies when signal paths traverse the 15 to 20 km altitude region, despite uncertainties in frequency scaling and the amount of turbulence below 15 km altitude. Author

N71-30854*# Scientific Translation Service, Santa Barbara, Calif.
THE SAMPLING THEOREM FOR THE IMAGE OBTAINED BY A CIRCULAR APERTURE AND ITS APPLICATIONS TO NUMERICAL CALCULATION OF AMPLITUDE, INTENSITY AND THEIR FOURIER TRANSFORMS WITH ANALYTICAL EXPRESSION OF RESPONSE FUNCTIONS [ENKEI KAIKO NI YORU ZO NI TAI-SURU SANPURINGN TEIRI TO SONO SUKA KEISAN E NO OYO]
H. Gamo Washington NASA Jul. 1971 37 p refs Transl. into ENGLISH from Oyo Butsuri (Tokyo), v. 26, 1957a. p 102–115
(Contract NASw-2035)
(NASA-TT-F-13720) Avail: NTIS CSCL 20F

An image sampling theorem for wave amplitudes obtained with a circular aperture is derived. Expressions for the complex amplitude in the image plane, sampling functions and coefficients, and the Fourier–Bessel pupil function expansion coefficient are given. The use of sampling theorems in amplitude and intensity interpolation is shown with the Airy figure at sharp focus. The relation between the circle polynomial expansion and the Fourier–Bessel pupil function expansion is considered as a preliminary to numerical calculation by sampling theorems. Response functions of a pupil with small aberrations are developed and discussed. J.M.

N71-30898# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DETECTABILITY DISTANCE OF TWO AGGREGATES (BENZENE AND DIESEL ENGINE) [HOORBAARHEIDSGRENS VAN TWEE AGGREGATEN (BENZINE EN DIESEL)]
A. M. Mimpen and T. Houtgast 1971 8 p ref In DUTCH; ENGLISH summary
(IZF-1971-6; TDCK-57590) Avail: NTIS

Distance frequency spectra for benzene- and diesel-aggregates were measured to determine their respective detectabilities. Calculated detection ranges were 5 km for optimal sound propagation conditions, and 3 km for the benzene and 2 km for the diesel-aggregate in the presence of small air pocket absorptions. With greater air absorption (cold, dry air) these calculated distances are 2400 m and 1600 m, respectively. It appears that the detectability is determined by the lower frequency bands (250 – 500 Hz). Verification on a calm, cold night revealed that both aggregates were undetectable at a distance of 2000 m and just detectable at a distance of 1500 m. Author

N71-30904*# National Aeronautics and Space Administration, Washington, D.C.
TRANSFORMATION OF INTENSITY MATRIX IN OPTICS BY A PUPIL [KOGAKU-KEI NO KYODO MATORIKKUSU NO HITOMI NI YORU HENKAN]
H. Gamo Jul. 1971 21 p refs Transl. into ENGLISH from Oyo Butsuri (Tokyo), v. 26, no. 9, 1957 p 414–421
(NASA-TT-F-13718) Avail: NTIS CSCL 20F

The intensity distribution of images is described by using positive-definite Hermitian matrices under various conditions of illumination. The intensity distribution of an image obtained by a pupil of numerical aperature alpha can be described. It is shown that the given intensity matrix A is transformed into another matrix B when the wave in an image by the pupil is transmitted through another pupil of numberical aperature beta, namely, $B = T^{*}AT$, where T is the transmission matrix concerning the second pupil and T^{*} is the matrix, the m,n-element of which is equal to the complex conjugate of n,m-element of the matrix T. Author

N71-30910*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE DEVELOPMENT OF CRYOGENIC STORAGE SYSTEMS FOR SPACE FLIGHT
Michael L. Davis, Robert K. Allgeier, Jr., Thomas G. Rogers (ITT Federal Elec. Corp.), and Gordon Rysavy Washington 1970 132 p refs
(NASA-SP-247) Avail: SOD $1.50; NTIS CSCL 20L

A comprehensive historical and informative report of the development of cryogenic gas storage systems is presented. The current storage systems used in manned space flight are discussed along with those of future missions. Some examples of nonaerospace uses are presented. F.O.S.

N71-31052# Physics Lab. RVO-TNO, The Hague (Netherlands).
THE EXAMINATION OF APPARENT TERRAIN REFLECTANCES
P. C. Slagter and M. Deutekom Nov. 1970 30 p
(PHL-1970-25; TDCK-57503) Avail: NTIS

The apparent reflectances of backgrounds against which objects of military interest have to be observed are examined by comparing the densities of many pictures of these backgrounds, taken under general conditions, with the densities caused by a calibration plate provided with ten well-known reflectance steps. Many pictures of the background are taken with different spectral sensitivities, among which a simulation of the S25 sensitivity which is used in image intensifiers. Results indicate that the use of panchromatic film as a simulator of the S25 sensitivity is not always a good approximation. Author

N71-31068 Michigan Univ., Ann Arbor.
THE USE OF PARA-TERPHENYL AS A DETECTOR IN THE EXTREME ULTRAVIOLET
Charles Paul Dyjak (Ph.D. Thesis) 1969 91 p
Avail: Univ. Microfilms Order No. 70-14506

A study was made of the performance of a para-terphenyl coated photomultiplier in the extreme ultraviolet region from 125 A to 325 A. The results are compared with those of earlier work in which Kodak SWR photographic plates, a Bendix resistance strip photomultiplier, and a sodium salicylate coated photomultiplier were studied. The light source was a vacuum spark between aluminum electrodes with a peak current of 30 kiloamps and was used with a 6 meter, grazing incidence, grating spectrograph. The p-terphenyl was vacuum evaporated on a cover glass slide to a thickness of about 2.74 mg/sq cm and was found to be stable over a period of at least ten days in vacuum. Over the range from 312 A down to 161 A, the efficiency of p-terphenyl was found to be essentially constant. On the other hand, the efficiency of Kodak SWR plates decreased by a factor of about ten, that of the Bendix detector decreased by about three, and the efficiency of sodium salicylate decreased by about four relative to p-terphenyl. Between 161A and 125A, however, the efficiency of the p-terphenyl decreased by about 45 per cent. Dissert. Abstr.

N71-31088 Brown Univ., Providence, R.I.
THEORETICAL AND EXPERIMENTAL STUDIES OF

ELECTROMAGNETIC WAVE PROPAGATION IN ANTIFERROMAGNETIC MANGANESE DIFLUORIDE
Kevin Christopher O'Brien (Ph.D. Thesis) 1969 92 p
Avail: Univ. Microfilms Order No. 70-8771

A theoretical and experimental investigation of the antiferromagnetic resonance (AFMR) in MnF2 is described. The general problem of electromagnetic wave propagation in a magnetic medium which can be described by a tensor of the Polder form is treated. Experimental investigations included studies of the shape, size, and frequency dependence of the millimeter wave AFMR in MnF2 at 4.2 K with frequencies ranging from 140 to 305 GHz and magnetic field applied along the symmetry axis. A study of various, sample configurations showed that the clearest resonance effects were observed for the case of a very thin sample which filled the cross-section of the waveguide. The results of these calculations, when compared with experimental data, show that the lineshape, linewidth, and amount of absorption can be described accurately, within experimental error, by a molecular field based calculation of the susceptibilities with a single adjustable parameter describing relaxation effects. The waveguide analysis gives much better agreement with experimental results than does the commonly used plane-wave analysis. Dissert. Abstr.

N71-31070 Ohio State Univ., Columbus.
RELAXATION STUDIES OF LOW ORTHO CONCENTRATION SOLID HYDROGEN AT VERY LOW TEMPERATURES
James Harris Constable (Ph.D. Thesis) 1969 121 p
Avail: Univ. Microfilms Order No. 70-13998

The majority of the measurements were made on alloys of ortho-hydrogen and para-hydrogen. The dependence of the spin lattice relaxation time T1 and the spin-spin relaxation time T2 upon the temperature, magnetic field, and ortho-hydrogen concentration was measured. The concentrations were 0.6%, 0.2%, and 0.1%. At temperatures below 0.5 K and near the origin of the free induction decay was a region of rapid relaxation which gradually gave way to a region of slow relaxation. The T1 and T2 of the two regions differed by several orders of magnitude. The values of T2 for the region of slow relaxation were found to increase with decreasing temperature. The values of T1 were found to increase inversely as the square of the concentration and be virtually independent of the temperature and magnetic field. Measurements of T1 were made for HD initially containing 0.36% o-H2. It was found that T1 increased exponentially with decreasing temperature. The activation energy was found to be 0.023 K, which gives an upper limit to the crystal field splitting in HD. The conversion rate of the o-H2 was measured to be 0.58% per hour. Dissert. Abstr.

N71-31095*# Scientific Translation Service, Santa Barbara, Calif.
MAGNETIC MEASUREMENTS IN EXPERIMENTS WITH MODELS [MAGNITNYYE IZMERENIYA V MODELNYKH EKSPERIMENTAKH]
E. M. Dubinin et al Washington NASA Jul. 1971 24 p refs Transl. into ENGLISH of Acad. of Sci., ISSR, Inst. of Space Res., Moscow, report Pr-14
(Contract NASw-2035)
(NASA-TT-F-13734; Pr-14) Avail: NTIS CSCL 20C

An experimental investigation of artificial solar wind interaction with a model of the magnetic dipole of the earth was conducted. To investigate the shape of the magnetosphere, including the tail and collisionless shock wave, the magnetic probe was used. Magnetic field lines of the plasma flux changed their direction at plasma interaction with dipole magnetic field. Author

N71-31137 Wisconsin Univ., Madison.
THERMAL AND MAGNETIC EFFECTS IN THE OPTICAL SPECTRA OF ANTIFERROMAGNETS
Merlin Walter Passow (Ph.D. Thesis) 1969 127 p
Avail: Univ. Microfilms Order No. 70-3657

A quantitative study of the thermal behavior of two pure electronic optical transitions in antiferromagnetic crystals is reported for temperatures below 35 K. Thermal shift and broadening of the pure electronic 6A1 yields 4A1, 4E(4G) transition of RbMnF3 in zero external magnetic field and the thermal broadening of the 18,418 cm pure electronic transition of MnF2 in zero and 25 KOe external magnetic field are reported. A one parameter theoretical expression is developed for the thermal shift and broadening of pure electronic optical transitions in a two sublattice antiferromagnet based on a nearest neighbor exchange interaction model including an external magnetic field. The satisfactory agreement of computer calculations based on this model with the experimental observations suggests that other broadening mechanisms are negligible at low temperatures for the transitions studied, and that the model can satisfactorily account for the observed behavior. Dissert. Abstr.

N71-31138 Illinois Univ., Urbana.
THE CRITICAL MAGNETIC FIELD CURVES OF SUPERCONDUCTING MOLYBDENUM AND CADMIUM ABOVE 0.03 K
David Gordon Hamblen (Ph.D. Thesis) 1969 87 p
Avail: Univ. Microfilms Order No. 70-13340

The critical magnetic field curves of molybdenum and cadmium were measured from T sub c to 0.03 K, using the critical field curve of aluminum as a thermometer. The data, when extrapolated to T = 0, yield values of H sub 0 = 96.24 gauss and gamma = 1.835 mJ/(mole deg sq K), for Mo, and H sub 0 = 28.05 gauss and gamma = 0.685 mJ/(mole deg sq K) for Cd. The extrapolation to H sub C = 0 yields T sub c values of 0.9134 K and 0.515 K for Mo and Cd respectively. These values, together with the experimental data, are used to calculate the superconducting electronic entropy and the deviation of the critical field curve from parabolicity over the entire temperature range. The results show satisfactory agreement with previous measurements, and with Clem's theory of anisotropy. Dissert. Abstr.

N71-31142*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTICAL IMAGING SYSTEM Patent Application
William D. Gunter, Jr. and Richard M. Brown, inventors (to NASA) 18 p Filed 19 Jan. 1971
(NASA-Case-ARC-10194-1; US-Patent-Appl-SN-107659) Avail: NTIS CSCL 20F

An optical imaging system for enabling nonabsorbed light imaged onto a photodetective surface to be collected and reimaged one or more times onto that surface in register with the original image is described. The system includes an objective lens, one or more imaging lenses, one or more retroreflectors and perhaps a prism for providing optical matching of the imaging lens focal planes to the photodetective surface. NASA

N71-31163 Maryland Univ., College Park.
A LINEAR OPTICAL TECHNIQUE FOR THE MEASUREMENT OF THE WIDTH OF ULTRASHORT OPTICAL PULSES
Richard Lee Smith (Ph.D. Thesis) 1969 107 p
Avail: Univ. Microfilms Order No. 70-13723

It was demonstrated that a linear optical technique can be used for the measurement of the width of ultrashort optical pulses which are produced by a mode locked laser. In this technique a train of pulses is split into two trains in a Michelson interferometer. By observing the time interval over which the pulses interfered, a measure of the width of the ultrashort pulses was obtained. Our results indicated the typical pulse width for the laser to be about 3 picoseconds. By looking at the overlap of consecutive picosecond pulses it was found that the total extent over which the interference was detected was at least 80 picoseconds and that the overlap region for consecutive ultrashort pulses was at least 13 picoseconds. It was also observed that the interference of

consecutive pulses decreased greatly from the beginning of a laser shot to the end. One of the advantages of the linear method is that in principle it can detect the presence of a low level background pulse upon which the high intensity portion may rest. Dissert. Abstr.

N71-31164 Minnesota Univ., Minneapolis.
ABSOLUTE INTENSITY MEASUREMENT IN THE LIQUID PHASE BY ATTENUATED TOTAL REFLECTION
John Charles Burr (Ph.D. Thesis) 1969 121 p
Avail: Univ. Microfilms Order No. 70-15709

A plan was suggested to develop, evaluate, and apply the attenuated total reflection (ATR) technique to the measurement of absolute, liquid phase, vibrational intensities. In order to determine the optical constants comprising the complex refractive index, it is necessary to measure the reflectivity under two different conditions. Measurement of the composite reflectivity - instrumentally weighted sum of parallel and perpendicular reflectivities - at two angles of incidence was found to be the optimum choice between photometric and informational accuracy. A set of monochromator fore-optics was designed to permit such measurement. Methods of solving for the optical constants from the measured reflectivities are given. Comparison of the integrated intensities obtained by this technique with the values obtained by various other techniques shows that ATR is applicable to bands of all intensities with the same or greater accuracy than that obtainable by the best of the other techniques. The method also furnishes the optical constants throughout the band measured. Dissert. Abstr.

N71-31176*# Stanford Univ., Calif. Dept. of Applied Mechanics.
KINEMATICS OF RIGID BODIES IN SPACEFLIGHT
T. R. Kane and P. W. Likins May 1971 178 p
(Grant NGR-05-020-209)
(NASA-CR-119361; SU-TR-204) Copyright. Avail: NTIS CSCL 20K

A unified treatment of the kinematical ideas for use in solving rigid body problems in space flight is presented. Mathematical expressions for simple, successive, and small rotations; direction cosines; Euler and Rodriques parameters; indirect determination of orientation; orientation angles; screw motion; angular velocity matrix, vector, and components; angular velocity and Euler and Rodriques parameters; indirect determination of angular velocity; auxiliary reference frames; angular velocity and orientation angles; slow, small rotational motions; instantaneous axis; and angular acceleration are included. J.M.

N71-31192*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
SPECTRAL REFLECTIVITY OF SOLID SURFACES AT LOW TEMPERATURES
M. C. Jones and D. C. Palmer 26 Oct. 1970 77 p refs
(NASA Order H-2153H; NASA Order H-62437A; NBS Proj. 2750474)
(NASA-CR-119869; NBS-9774) Avail: NTIS CSCL 20L

Experimental data are presented for the normal spectral absorptivity of the transition metals nickel, iron, platinum and chromium at both room and liquid helium temperatures in the wavelength range 2.5 to 50 micrometers. The absorptivity was derived from reflectivity measurements made relative to a room-temperature vapor-deposited gold reference mirror. The absorptivity of the gold reference mirror was measured calorimetrically using infrared laser sources. Investigation of various methods of sample surface preparation resulted in the choice of a vacuum annealing process as the final stage. Results are compared to calculations based on a 2-band model. The first band is identified with the s-electrons but it is necessary to determine material parameters for the second band empirically. The same technique is used to measure the normal spectral reflectivity of an indium antimonide sample at 10.6 K. The data are fitted to a classical reflectivity function from which an accurate value for the bremsstrahlung frequency is obtained. Author

N71-31229*# Mound Lab., Miamisburg, Ohio.
TECHNIQUE FOR DIRECT MEASUREMENT OF THERMAL POWER IN ASSAY CALORIMETERS
G. W. Otto and K. C. Jordon 9 Apr. 1971 12 p refs
(Contract AT(33-1)-GEN-53)
(MLM-1780) Avail: NTIS

A new method for the direct measurement of the power input to a servo-controlled calorimeter is described. As applied to assay-type calorimeters the method reduced the analytical time in half and maintained or exceeded previous levels of accuracy in the determination of the thermal power of unknown samples. Additional benefits include applicability to all past and present calorimeters, and ready adaptability to automation by digital computer. Author (NSA)

N71-31306 Illinois Univ., Urbana.
MAGNETISM IN NICKEL-COPPER ALLOYS
Charles Gordon Robbins (Ph.D. Thesis) 1969 282 p
Avail: Univ. Microfilms Order No. 70-13457

Low temperature specific heat as well as magnetic data indicate that there are magnetic moments present in Ni-Cu solid solutions up to at least 70 atomic% Cu. There are also other types of data showing that the above assumption is wrong. The decrease of the average ferromagnetic moment with increasing Cu content can be described in terms of the local atomic environment of the Ni atoms. The measured low temperature specific heat term, linear in temperature, which has a maximum at 52 atomic% Cu, includes a magnetic contribution for alloys near that composition. Another magnetic contribution to the low temperature specific heat of Ni-Cu alloys, close to the critical composition, is independent of the temperature within the temperature range of the measurements. This contribution is due to the thermal excitation of magnetic clusters. The rigid band model is not able to describe the behavior of the low temperature specific heat of Pd-Cu alloys. Dissert. Abstr.

N71-31361 Virginia Polytechnic Inst., Blacksburg.
EFFECTS OF THE SUPERCONDUCTING TRANSITION OF THE PURE QUADRUPOLE RESONANCE FREQUENCIES IN dhcp LANTHANUM METAL
Wade Martin Poteet (Ph.D. Thesis) 1970 76 p
(Grant NSF GP-7165)
Avail: Univ. Microfilms Order No. 70-13894

Measurements of the pure nuclear quadrupole resonance (PQR) frequencies of La-139 in dhcp La metal in both its superconducting and normal states have been made using superregenerative spectrometer techniques. PQR associated with the 3/2 - 5/2 and 5/2 - 7/2 transitions in the spin-7/2 La-139 nucleus was observed at both inequivalent sites in the dhcp structure over the temperature range 4.2 to 12 K, and the results for both sets of PQR frequencies show a definite shift on passing through the superconducting transition temperature, T sub c. The results for the 3/2 - 5/2 and 5/2 - 7/2 PQR frequencies in the normal state give the values 7.700(2) MHz and 8.798(4) MHz for the quadrupole coupling constant at the two sites. The corresponding shifts in the magnitude of the total electric field gradient on passing from the normal to the superconducting state are +0.10 per cent and +0.14 per cent and occur at about 4.5 K, coinciding with the observed T sub c for the sample. Dissert. Abstr.

N71-31423*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACOUSTICAL MEASUREMENTS OF THE VORTEX NOISE FOR A ROTATING BLADE OPERATING WITH AND WITHOUT ITS SHED WAKE BLOWN DOWNSTREAM

James Schieman, David A. Hilton, and James P. Shivers Washington Aug. 1971 87 p refs
(NASA-TN-D-6364; L-7715) Avail: NTIS CSCL 20A

Tests to make acoustical measurements of rotating-blade vortex noise were conducted at the Langley Research Center. Measurements were made for two different blade sections with several tip shapes. The blades were operated in their own shed wake and also with the shed wake blown downstream. The results are tabulated and presented as the 1/3-octave-band acoustical amplitude along with the corresponding test conditions. Preliminary evaluation indicates that the tip-shape changes had very little effect on the overall sound pressure level. The results confirm that the acoustical radiation is related to the form drag. Introducing axial velocity to blow away the blade shed wake for a rotating blade of circular cross section resulted in an increase in the overall noise level while the overall noise level decreased for an airfoil-section blade. Author

N71-31435*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACOUSTIC SCATTERING AND ABSORPTION BY A RIGID POROUS ELLIPTIC CYLINDRICAL SHELL
William E. Zorumski Washington Aug. 1971 31 p refs
(NASA-TN-D-6340; L-7668) Avail: NTIS CSCL 20A

Solutions for scattering of a plane wave from a thin rigid porous elliptic cylindrical shell are found in terms of Mathieu functions. The scattering problem reduces to an infinite set of linear equations for the coefficients of the velocity expansion on the cylindrical surface. Coupling terms in these equations are given by integrals which are evaluated by exact methods. Solutions are found by the method of reduction for the internal standing waves and the external scattered waves. A special case of variable acoustic impedance is found where the infinite systems uncouple so that closed-form solutions may be obtained for the velocity coefficients. Computations are made for scattering in the intermediate frequency range, where the wavelength is of the same order of magnitude as the major axis of the cylinder. Tabulations of the scattered and dissipated energies are given for various cylinder eccentricities, impedances, angles of incidence, and frequencies. Author

N71-31452*# Scientific Translation Service, Santa Barbara, Calif.
MATHEMATICAL ANALYSIS OF THE INTENSITY DISTRIBUTION OF OPTICAL IMAGES FOR VARIOUS DEGREES OF COHERENCE OF ILLUMINATION REPRESENTATION OF INTENSITY BY HERMITIAN MATRICES [SHOMEI NO KOHIIRENSU-SEI WO KORYO SHITA KOGAKU-ZO NO KYODO-BUNPU NI KAN-SURU RIRON: KYODO NO ERUMIITO GYORETSU NI YORU HYOJI]
H. Gamo Washington NASA Jul. 1971 37 p refs Transl. into ENGLISH from Oyo Butsuri (Tokyo), v. 25, no. 11, 1956 p 431–443
(Contract NASw-2035)
(NASA-TT-F-13721) Avail: NTIS CSCL 20F

A formula for the intensity distribution of images by an optical system having a given aperture constant in the absence of both aberration and focusing defects is obtained by considering the nature of illumination namely: coherence, partial coherence, and incoherence. This formulation is used in information theory of optical systems. Author

N71-31513# California Univ., Livermore. Lawrence Radiation Lab.
ELECTRICAL RESISTANCE OF YTTERBIUM AS A FUNCTION OF TEMPERATURE AND PRESSURE
E. M. Lilley and D. R. Stephens 4 Feb. 1971 13 p refs Sponsored by AEC
(UCRL-51006) Avail: NTIS

The piezoresistance of ytterbium from three sources was measured at pressures up to 40 kbar and at temperatures between 21 and 90 C under hydrostatic and quasi-hydrostatic conditions. From the data, from calculations of Hugoniot state temperatures, and from the geometrical effect of plane strain on resistance, the piezoresistance of ytterbium along the Hugoniot was calculated. The computed results agreed with the experimental Hugoniot data for the same samples to within 10%. Although resistance hysteresis upon unloading from the Hugoniot was observed in shock studies, no measurable hysteresis was seen at constant temperatures below the fcc-to-bcc transition. Only minor resistance hysteresis was predicted on the basis of the temperature differences between the Hugoniot and the release states. The fcc-to-bcc transition in ytterbium, which occurs between 37 and 39 kbar at room temperature, was predicted to occur between 34 and 35 kbar along the Hugoniot as the transformation pressure decreases with increasing temperature. Author (NSA)

N71-31577# Jyvaskyla Univ. (Finland). Dept. of Physics.
PHASE-SPACE INTEGRAL WITH TRANSVERSE MOMENTUM CUT-OFF
Seppo Sohlo Dec. 1970 13 p refs
(NP-18748; RR-16/1970) Avail: AEC Depository Libraries

The phase-space integral is calculated using a four-dimensional Laplace transformation and the saddle-point method. In the transformation there are left two parameters of which the longitudinal one vanishes when the total energy goes to infinity and the transversal one is inversely proportional to the transverse momentum of one secondary particle. The parameters are interpreted as inverse longitudinal and transversal temperatures. Momentum spectra and inelastic cross sections are found in agreement with the main features of experimental data. The energy dependence of one particle momentum spectrum with fixed multiplicity is similar to the inelastic cross section. After summing over multiplicity, a momentum distribution and total cross section can be obtained, which are constant in energy. The momentum spectrum depends on transverse momentum. Author (NSA)

N71-31579# Texas Univ., Auston. Applied Research Labs.
AN ANALYSIS OF THE PARAMETRIC ACOUSTIC ARRAY FOR SPHERICAL WAVE FIELDS
Thomas G. Muir (Ph.D. Thesis) May 1971 170 p refs
(Contract N00014-70-A-0166)
(AD-723241; ARL-TR-71-1) Avail: NTIS CSCL 20/1

The nonlinear interaction of two collinear acoustic waves to produce a modulation product in the lower sideband is examined both theoretically and experimentally. The modulation takes place in a portion of the medium specified by the beamwidth and the absorption of the primary radiations. The difference-frequency sound so created has significance in engineering applications because of the high directivity it derives from the great length of the zone of interaction. In this sense, the phenomenon may be thought of as a parametric, end-fired acoustic array. The theoretical approach of Westervelt is adapted to obtain solutions for the interacting fields composed to beams of monochromatic spherical waves emitted by circular piston projectors. The analysis is accomplished by an asymptotic method that is valid at long ranges from the interaction volume and by a more exact method involving a numerical integration that is valid in the farfield of the electroacoustic source. Beam pattern and sound propagation data resulting from several experiments conducted in a fresh water lake are presented to demonstrate the validity of the numerical solution. Author (GRA)

N71-31583# Texas Univ., Austin. Applied Research Labs.
ON THE INTEGRAL FORMULATION OF SCALARWAVE SCATTERING BY ARBITRARY SURFACES
Patrick J. Welton 17 Dec. 1970 52 p refs
(Contract N00024-70-C-1279)
(AD-723845; ARL-TM-70-39) Avail: NTIS CSCL 12/1

A critical analysis of the integral formulation of scalar wave reflection, diffraction, and scattering by arbitrary surfaces is presented. For the exterior problem the potential formulation is found to be superior to the Greens function and the Helmholtz formula representations of the problem. The potential method leads to a self-consistent specification of the boundary values, and results in terms which in the case of scattering are clearly identifiable as the singly- and multiply-scattered field components. Only the singly-scattered field term is specialized to a form that is convenient for reflected or scattered pressure and intensity calculations. Stochastic techniques are introduced, and it is shown in a formal way how shadowing can be rigorously included in the theory. Author (GRA)

N71-31599# TRW Systems Group, Redondo Beach, Calif.
ACOUSTIC BUBBLE DETECTION: ACOUSTIC-OPTICAL IMAGING TECHNIQUES FOR DECOMPRESSION STUDIES Annual Report
L. L. Higgins, D. Knox, and W. W. Simmons 31 Mar. 1971 113 p refs
(Contract N00014-69-C-0231)
(AD-723596; TRW-12833-6008-R0-00) Avail: NTIS CSCL 20/6

The acoustic-optical imaging process utilizes Bragg diffraction of light by a beam of sound to produce an optical image of an acoustically irradiated object. Inasmuch as many materials which are quite opaque to light are, to varying degrees, transparent to certain acoustic frequencies, the technique offers the possibility of visually examining the internal structure of optically opaque bodies. The imaging of internal features is made possible by the fact that different materials and structures often have different acoustic characteristics, thus causing the sound to be reflected, scattered, absorbed and diffracted. These factors cause perturbations in the acoustic wavefronts which are transformed in the light-sound interaction into a visual image, in real time, which may be observed by eye, photographed by a camera, or processed by other conventional optical methods. In addition to bubble detection, acoustic-optical imaging techniques appear to be applicable to a wide range of diagnostic procedures and methods of medical instrumentation where the ability to observe internal structures is of significance. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N71-30404# Lund Inst. of Tech. (Sweden). Dept. of Nuclear Physics.
PHOTOMESON EFFECTS IN (GAMMA, n) AND (GAMMA, p) REACTIONS IN LIGHT NUCLEI
B. Friberg, G. Anderson, and B. Forkman Sep. 1970 34 p refs Prepared in cooperation with Lund Univ.
(LUNP-7009) Avail: AEC Depository Libraries

Yield curves have been determined for (gamma,n)-reactions in N-14, O-16, F-19 and P-31 and for the reaction Si-30(gamma,p)Al-29 at maximum bremsstrahlung energies between 100 and 800 MeV. Above 200 MeV there is a difference between the determined yield and that predicted from the contributions from the giant resonance and, at higher energies, the quasi-deuteron absorption process. From the difference, which is assumed to represent the (gamma,n) or (gamma,p)-reaction via meson production, the number of nucleons that can contribute to the reaction is calculated. The results are in good agreement with simple shell-model considerations. Author (NSA)

N71-30405# Uppsala Univ. (Sweden). Inst. of Physics.
TABLE OF PERTURBATION COEFFICIENTS FOR A FREE HYPERFINE INTERACTION IN A PARALLEL EXTERNAL MAGNETIC FIELD
F. Falk, A. Linnfors, B. Orre, and J. E. Thun Apr. 1970 21 p refs
(UUIP-690) Avail: AEC Depository Libraries

Integral attenuation coefficients of angular correlations perturbed by a free hyperfine interaction and a parallel external magnetic field were calculated. Nuclear spins I from 1 to 5/2 and atomic spins J less than 5/2 are considered. The internal interaction is assumed to be of magnetic origin. Author (NSA)

N71-30411# Akademiya Nauk URSR, Kharkov. Fiziko-Tekhnicheskii Inst.
RESEARCH ON THE 100 MeV ELECTRON STORAGE RING OF THE TECHNICAL PHYSICS INSTITUTE OF THE UKRAINIAN ACADEMY OF SCIENCES
Yu. N. Grigorev, I. A. Grishaev, I. I. Koba, S. G. Kononenko, N. I. Mocheshnikov et al 1969 9 p refs In RUSSIAN
(KHFTI-69-27) Avail: AEC Depository Libraries

Studies of low-intensity beam parameters were carried out; the longitudinal motion of particles under various conditions was investigated; and experiments were begun on a beam of synchrotron radiation. The basic parameters of the storage ring are given. The radial dimensions of the beam are given as a function of the electron energy. Data are given to characterize the effect of resonances on the life time of the beam. The most dangerous resonances were those with nu sub Z = 3/4 and nu sub Z = 5/4. It is shown that phase dampening takes place much faster, and energy dampening takes place slower than at small oscillations. Interferometer experiments show the presence of interference in synchrotron radiation. NSA

N71-30412# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
EQUAL TIME COMMUTATOR, SUM RULES AND WARD IDENTITIES IN AXIOMATIC QUANTUM FIELD THEORY
V. A. Miranskii 1970 17 p refs
(ITF-70-57) Avail: AEC Depository Libraries

The equal-time commutator of currents in the axiomatic quantum field theory is considered. Using some of V. A. Vladimirov's theorems, the number and the structure of Schwinger terms depending on the asymptotical behavior, the Fourier transforms of the retarded functions at infinity are established. As a consequence sufficient conditions for the validity of Gell-Mann-Fubini sum rules are obtained. The validity of normal Ward identities in axiomatic field theory is discussed. Author (NSA)

N71-30413# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ON THE ADDITIONAL INVARIANCE OF THE RELATIVISTIC EQUATIONS OF MOTION
V. I. Fushchich 1970 17 p refs Presented at Seminar on Theory of Elementary Particles Theory, Kiev
(ITF-70-32) Avail: AEC Depository Libraries

An additional (implicit) symmetry of equations of motion is studied which is invariant with respect to the Poincare group. It is shown that any relativistic equation of motion is invariant with respect to the Lie algebra of the inhomogeneous de Sitter group. The relativistic two-component equation describing a free motion of the spinless particle with zero mass is found. Author (NSA)

N71-30416# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
DEFINITION OF QUASI-AVERAGES
N. N. Bogolubov, Jr. 1970 20 p refs Presented at Seminar on the Theory of Elementary Particles, Kiev

(ITF-70-52) Avail: AEC Depository Libraries

Some difficulties are considered connected with the definition of quasi-averages for the model systems with a negative four-fermion interaction. A new method of introducing the auxiliary system and definition of quasi-averages is developed. At the same time the problem of limiting expressions for the free energy (when V approaches infinity) is solved. Author (NSA)

N71-30417# Paris Univ., Orsay (France).

ADVANCES IN THE STUDY OF GEMANIUM DETECTORS AND THEIR USE FOR CHARGED PARTICLES, EXPERIMENTAL STUDY OF (d,d'), (d,p), (d,t) REACTIONS ON C 12 AT 80 MeV [CONTRIBUTION A L'ETUDE DES DETECTEURS AU GERMANIUM ET A LEUR UTILISATION EN PARTICULES CHARGEES. APPLICATION A L'ETUDE EXPERIMENTAL DES REACTIONS (d,d') (d,p) (d,t) A 80 MeV SUR C-12]

Marcus Luc (Ph.D. Thesis) 1970 87 p refs In FRENCH

(NP-18570) Avail: AEC Depository Libraries

Several Ge(Li) detectors for gamma ray spectrometry were studied. The ion implanation methods and the difficulties encountered in selecting types which could be used for deuteron detection are discussed. An 80-MeV deuteron beam revealed the existence of randomly distributed nondetecting dead zones in certain detector crystals; the resolution of the active zones was 130 keV. The positions of the peaks depended upon whether the particles impinged upon the face or the sides of the crystal, due to preferential trapping of the holes and the electrons. A calculation on the charge collection confirmed the predominant trapping of the electrons and led to values for the trapping factors which were admissible with the resolution sought. When these detectors were used in deuteron scattering experiments, a peak-to-valley ratio of about 1000 and an efficiency of 86% were achieved. Over a large excitation energy range, the spectra of protons > 28 MeV, deuterons > 28 MeV, and tritons >40 MeV associated with reactions induced by 80-MeV deuterons with C-12 between 11 deg and 42 deg were studied. NSA

N71-30418# Leiden Univ. (Netherland).

A STUDY ON NEUTRON-CAPTURE GAMMA-RAY SPECTRA FROM ALIGNED NEODYMIUM AND SAMARIUM NUCLEI

Ewout Roelof Reddingius (Ph.D. Thesis) 1969 95 p refs

(NP-18485) Avail: AEC Depository Libraries

Neutron capture in the thermal energy range was used to study neodymium and samarium. The linear polarization and anisotropy of the gamma rays from aligned Nd-143 and Sm-149 were measured by cooling these nuclei to 0.01 K by using adiabatic demagnetization. These anisotropy measurements were done with natural Nd and Sm. Since the samples contained several stable isotopes, all of which could contribute to the results, separate measurements were made on targets enriched in Nd-145, Sm-147, and Sm-152 to allow subtraction of their contributions. Decay schemes are presented for the nuclides Nd-144, Nd-146, Sm-148, Sm-150, and Sm-153. NSA

N71-30422# British Petroleum Co., Ltd., Sunbury-on-Thames (England). Research Centre.

CALCULATION OF THE PHASE-SHIFT OF AN ELECTRON BEAM SCATTERED BY A NICKEL ATOM

R. W. Leay 28 Aug. 1970 10 p refs

(NP-18640; TM-110192) Avail: AEC Depository Libraries

The phase change of a beam of electrons scattered by a single nickel atom is calculated and tabulated for beam energies of 2 to 100 V. Only s-wave scattering is considered. This information was needed in studies of the behavior of electrons at alloy surfaces. Author (NSA)

N71-30428# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.

APPROXIMATE EXPRESSION FOR IONIZATION LOSS AND RANGE OF FAST PARTICLES

I. K. Vzorov 1971 9 p refs In RUSSIAN

(JINR-P1-5676) Avail: AEC Depository Libraries

It is shown that the Bethe–Bloch formula for ionization loss by fast charged particles can be reduced to an approximate expression and that an analytical form can be obtained for the range-energy relation. In this case the accuracy of calculation will be not more than + or − 5% for the ionization loss and + or − 2 to 4% for the range. Author (NSA)

N71-30426# Paris Univ., Orsay (France). Faculte des Sciences.

STUDY OF DISTORTION IN THE REACTIONS (COPLANAR AND NONCOPLANAR) C-12(p,2p)B-11(1P) AND Ca-40(p,2p)K-39(2S) AT 156 MeV [ETUDE DE LA DISTORSION DANS LES REACTIONS C-12(P,2P)B-11 ET CA-40(P,2P)K-39(2S) COPLANAIRES ET NON-COPLANAIRES, A 156 MEV]

Eid Hourany (Ph.D. Thesis) 13 Feb. 1970 73 p refs In FRENCH

(NP-18476) Avail: AEC Depository Libraries

The correlation of the angular distributions (coplanar and noncoplanar) for the reactions C-12(p-2p)B-11 in the 1P3/2 state and Ca-40(p,2p)K-39 in the 2S1/2 state was measured, in view of studying over a large kinematic region the mechanism of the reaction (p,2p) and the distortion affecting the three protons of the reaction in the nuclear material. At 156 MeV and for targets of C-12 and Ca-40 the distortion affecting the (p,2p) reaction was not sufficiently important to produce a strong localization of the reaction in the nucleus. The shape of the experimental angular distributions was the same as those of the distributions calculated using the momentum approximation and plane waves. Several optical potentials explained the results, but an optical potential explaining the coplanar distribution of the (p,2p) reaction did not necessarily explain the noncoplanar distribution. The use of optical potentials, derived from the elastic scattering of protons, in the (p,2p) reactions, was a reasonable approach. NSA

N71-30429# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.

NOTE ON QUANTUM DYNAMICAL SYMMETRIES

G. F. De Angelis and G. Vilasi 1970 13 p refs

(CNRS-CPT-70-P-353) Avail: AEC Depository Libraries

The problem is considered of finding, for a given quantum system, a compact Lie group of symmetries such that to any energy level there corresponds an irreducible representation of the group. It is concluded that this is only possible in particular cases, and that, in general, to a given energy level there corresponds a reducible representation of the group. Examples of such behavior are given. NSA

N71-30430# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.

ABOUT A SPACE-TIME OPERATOR IN COLLISION DESCRIPTIONS

V. S. Olkhovskii and E. Recami 1970 14 p refs

(ITF-70-65-E) Avail: AEC Depository Libraries

Some previous works about space-time description of collision processes are partially concluded. Namely, a (nonnormal) chronotopical coordinate operator, previously suggested, is considered, and it is shown how its Hermitian parts work in the relativistic wave-packet formalism. The spin-zero-particle case is analyzed, and the canonical correspondence between the tetraflux and the chronotopical operators, for free Klein–Gordon particles, is underlined. The operator introduced for time is particularly emphasized. As an application the time-evolution of potential scattering is evaluated comparing the U-matrix and the S-matrix treatments. Besides the possible meaning of the anti-Hermitian parts of the operators above considered is investigated, in the spirit of a discrete space-time description. Author (NSA)

N71-30431# United Kingdom Atomic Energy Authority, Harwell (England).
ATOMIC ENERGY RESEARCH ESTABLISHMENT. RADIATION SAFETY STANDARDS, 1969
Oct. 1970 66 p refs Transl. into ENGLISH from the publ. 'Normy Radiatsionnoi Bezopasnosti (NRB-69)' Moscow, Atomizdat., 1970
(AERE-Trans-1134; HL70/5854(C10); NRB-69) Avail: AEC Depository Libraries; UK 45p

Basic radiation safety standards adopted in the Soviet Union in 1969 are presented. The standards are based on the recommendations of the International Commission on Radiological Protection (ICRP). NSA

N71-30432# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
COMPUTATIONAL ANALYSIS OF FEYNMAN DIAGRAMS. APPLICATION TO THE CALCULATION OF THE ANOMALOUS MAGNETIC MOMENT OF THE ELECTRON AND OF THE MUON [ANALYSE DES DIAGRAMMES DE FEYNMANN PAR ORDINATEUR. APPLICATION AU CALCUL DU MOMENT MAGNETIQUE ANOMAL DE L'ELECTRON ET DU MUON]
Jacques Calmet (Ph.D. Thesis - Aix-Marseilles Univ.) 1970 131 p refs In FRENCH
(CNRS-CPT-70-P-336) Avail: AEC Depository Libraries

If the anomalous part of the magnetic moment of the electron and muon is to be measured, theoretical knowledge of the contributions proportional to alpha(3) (alpha is the fine structure constant) is required. Programs for constructing Feynman diagrams of a given order in the series of the perturbations are presented. The theory of the renormalization formulas in the framework of the functional formalism leads to a recurrence relation defining the fine contributions of preceding orders and the correction terms. The diagrams can be generated from this equation, which is written directly in LISP language. The problem of radiative corrections for the case of three interacting fields is treated. The contributions of the Feynman diagrams to the anomalous magnetic moment of the electron are calculated. The internal uv divergences are eliminated by using a numerical method to evaluate the multiple integrals. The results obtained for the contributions of the diagrams containing vacuum polarization are given. NSA

N71-30433# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
REPRESENTATIONS OF n-POINT FUNCTIONS
N. N. Bogolyubov and V. S. Vladimirov 1971 29 p refs In RUSSIAN
(JINR-P2-5662) Avail: AEC Depository Libraries

The structure of the n-point functions, which are the Fourier-Laplace transforms of two tempered distributions with supports in the closed n-point future and past light cones and which coincide in the Jost points, is investigated. In particular, for one-point functions a new proof of the representation is constructed. Author (NSA)

N71-30437# Australian National Univ., Canberra. Research School of Physical Sciences.
SOME PHENOMENA PRODUCED BY POSITIVE ION BOMBARDMENT OF METAL SURFACES AT MEDIUM ENERGIES
E. R. Cawthron (Ph.D. Thesis) Dec. 1969 183 p refs
(NP-18490) Avail: AEC Depository Libraries

Secondary electron emission coefficients, apparent total ion scattering, and energy distributions of secondary electrons and scattered ions resulting from bombardment of polycrystalline and semicrystalline surfaces by ions of 5 to 50 keV were studied. Target materials were Ni, Mo, Ta, Pt, and reactor-grade graphite. Ions included H(+), H2(+), H3(+), D(+), D2(+), D3(+), He(+), C(+), Ni(+), N2(+), O(+), O2(+), Ne(+), Ar(+), and CO2(+). The effects of incident-ion velocity, the atomic numbers of both incident ions and target materials, and angle of incidence of the ion on the emission and scattering processes were measured. A review of the theoretical basis of the work detailed descriptions of the apparatus used, and numerous tables and graphs of data are included. NSA

N71-30438# Paris Univ., Orsay (France). Faculte Des Sciences.
STUDY OF THE MECHANISM OF THE (He 3,alpha) REACTION AT LOW ENERGY. APPLICATIONS TO THE STUDY OF Si 27 AND S 31 LEVELS [ETUDE DU MECANISME DE LA REACTION (He 3,alpha) A BASSE ENERGIE. APPLICATION A L'ETUDE DES NIVEAUX DE Si 27 ET S 31]
Georges Rotbard (Ph.D. Thesis) 1970 41 p refs In FRENCH
(NP-18464) Avail: AEC Depository Libraries

The excitation energy for 11 levels of Si-27, 15 levels of S-31, the angular distributions at 7.6 MeV for the reactions populating the fundamental levels and several excited levels of Si-27 and S-31 were obtained. The excitation functions for the reactions Si-28(He-3,alpha)Si-27 at 20 deg and S-32(He-3,alpha)S-31 at 65 deg (the angles chosen were the maxima of the angular distribution) and the angular distributions for several incident alpha energies of the reactions populating the fundamental and the two first excited states of Si-27 and the fundamental level of S-31 were investigated. The analysis of the results in conjunction with those obtained at higher energy, led to the conclusion that for the (He-3,alpha) reaction at an incident energy of about 8 MeV there is competition between direct pick-up and other reaction mechanisms. The experimental values of the spectroscopic factors were in satisfactory agreement with those calculated using the shell model with residual interaction. Author (NSA)

N71-30439# Grenoble Univ. (France). Faculte des Sciences.
NEUTRON ACTIVATION DETERMINATION OF NITROGEN IN STEELS AND NIOBIUM [CONTRIBUTION AU DOSAGE PAR ACTIVATION NEUTRONIQUE DE L'AZOTE DANS LES ACIERS ET LE NIOBIUM]
Paul Guazzoni (Ph.D. Thesis) 1970 66 p refs In FRENCH
(NP-18566) Avail: AEC Depository Libraries

The following two reactions were used, N-14(n,2n)N-13 and N-14(n,p)C-14, and in each the sensitivity and measurement limit (better for the reaction leading to C-14) the precision, and the interferences were investigated. The speed of analysis favors the reaction leading to N-13, while only that giving C-14 can be used to measure small traces. The nitrogen separation methods suitable for each of these matrices were studied. NSA

N71-30444# Max-Planck-Institut fur Physik und Astrophysik, Munich (West Germany).
CONSTRUCTION OF A PROTON SOURCE FOR THE ENERGY RANGE 2 TO 13.5 MeV [AUFBAU EINER PROTONENQUELLE FUER DEN ENERGIEBEREICH 2-13,5 MeV]
O. Vollmer Jul. 1969 63 p refs In GERMAN
(MPI-PAE/EXTRATERR-31) Avail: AEC Depository Libraries

A proton source which yields protons with energies between 2 and 13.5 MeV is described. These are recoil protons produced by monoenergetic 14.1-MeV neutrons in a thick plastic scintillator (NE 102 A). A continuously working neutron tube is used as neutron source. Two different coincidence arrangements are used for energy selection of the recoil protons and for suppression of the background. For proton energies between 13.5 and 7 MeV the energy loss of the recoil protons in the target scintillator measured with a multiplier is used for energy selection. The energy resolution was determined by the target scintillator and is between 700 keV FWHM at 13.5 MeV and 1200 keV FWHM at 8 MeV. The resolution is 900 keV FWHM at 8 MeV and 550 keV FWHM at 2 MeV. The rate of counted protons is about 15 pulses/hr. Author (NSA)

N71-30445# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.

QUASI-ELASTIC KNOCKOUT OF NUCLEONS FROM LIGHT NUCLEI BY HIGH ENERGY ELECTRONS

V. K. Tartakovskii and A. A. Pasichnyi 1970 17 p refs In RUSSIAN; ENGLISH summary

(ITF-70-38) Avail: AEC Depository Libraries

Inelastic high-energy electron scattering by light nuclei accompanied by knockout of nucleons is considered. The one-particle nucleon wave functions used in the bound state and in the state with positive energy were taken in the form of the exact solutions of Schrodinger's equation with the Woods–Saxon potential. The dependence of the disintegration process cross-section on the potential parameters is investigated. The calculated cross sections are compared with the experimental ones for C-12. The possibility of taking into account the nucleon-wave deformation in the finite state is shown. Author (NSA)

N71-30446# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.

SOLUTION OF UNITARITY CONDITION FOR THE ELASTIC SCATTERING AMPLITUDE FOR HIGH ENERGIES

V. I. Savrin, N. E. Tyurin, and O. A. Khrustalev 1970 17 p refs In RUSSIAN

(ITF-70-49) Avail: AEC Depository Libraries

The method of obtaining the elastic scattering amplitude for high energies is suggested based on using the unitarity condition for the partial amplitudes. To calculate imaginary and real parts of the elastic scattering amplitude, and also Legendre coefficients of inelastic channel contribution of the reaction, one should give some real functions as well (the phases of purely elastic scattering corresponding to two-particle unitarity condition). The comparison of the given method with quasi-potential consideration is carried out. Author (NSA)

N71-30450# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

RADIOACTIVE CONTAMINATION IN WORKSHOPS AND LABORATORIES. VOLUME 3: INDIVIDUAL PROTECTION TECHNIQUES [LA CONTAMINATION RADIOACTIVE DES ATELIERS ET LABORATOIRES. TOME 3: LES TECHNIQUES DE PROTECTION INDIVIDUELLE]

Bernard Werderer Feb. 1971 160 p refs In FRENCH

(CEA-N-1408(3)) Avail: AEC Depository Libraries

The general principles concerning the safety of the individual and physiological factors concerning the protection of the respiratory system against radioactive particles are discussed. Protective respiratory apparatus is considered with respect to the protection it affords from the contaminated environment, safety considerations, and comfort. Protective equipment against external contamination (mainly suits) is reviewed. Special pressurized and unpressurized sealed suits are examined in relation to the degree of protection afforded and the working conditions envisaged. The comfort experienced by the wearers is dependent upon the temperature and humidity inside the suits. NSA

N71-30451# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

RADIOACTIVE CONTAMINATION IN WORKSHOPS AND LABORATORIES. VOLUME 1: TECHNIQUES FOR DETECTION AND MEASUREMENTS [LA CONTAMINATION RADIOACTIVE DES ATELIERS ET LABORATOIRES. TOME 1: LES TECHNIQUES DE DETECTION ET DE MESURE]

Benard Werderer Feb. 1971 51 p refs In FRENCH

(CEA-N-1408(1)) Avail: AEC Depository Libraries

Techniques associated with the monitoring of water and of air are reviewed, together with techniques for the measurement of surface contamination, under the following headings: units for estimation of contamination by fluids (concentration, accumulated activity); factors affecting the sampling of a fluid (homogeneous and heterogeneous dispersion, dispersion in space, effect of speed of sampling, sedimentation in sampling devices, adsorption on sampling devices); principles of measurement of fluids (direct measurement of sample, collecting activity present in a fluid, collecting atmospheric contamination, collection of aerosols, collecting activity present in water); interpretation of results (inhaled activity, long-lived sources of radiation); principal types of apparatus for measuring accumulated activity (discontinuous monitoring, continuous monitoring); apparatus for measurement of concentration. NSA

N71-30455# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.

INVESTIGATIONS OF THE Gd-155 LEVELS BY THE METHOD OF DELAYED COINCIDENCES AND ANGULAR GAMMA-GAMMA CORRELATIONS

Ya. Vavryshchuk, N. V. Vinogradova, V. A. Morozov, V. I. Razov, Ya. Sazhinski et al 1970 12 p refs In RUSSIAN

(JINR-P6-5518) Avail: AEC Depository Libraries

The half-lives were measured and the spins of some Gd-155 levels were determined by the method of delayed coincidences and angular gamma-gamma correlations. Author (NSA)

N71-30456# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.

SATURATION FOR THE INTERACTION WITH HARD CORE

V. N. Maksimenko and A. I. Steshenko 1970 10 p refs

(ITF-70-67-E) Avail: AEC Depository Libraries

The possibility of providing for stability with respect to contraction for some two-body exchange central potentials with hard cores is investigated in the light doubly-magic nuclei He-4, O-16, and Cd-40. The calculation is carried out by the variational method on oscillator functions. The hard core is considered in the gas approximation. The results turn out to be negative. Author (NSA)

N71-30461# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.

METHOD OF PRECISE DETERMINATION OF PARTICLE COORDINATES IN PROPORTIONAL CHAMBER

V. A. Biryukov, V. G. Zinov, and A. D. Konin 1971 8 p refs In RUSSIAN

(JINR-P13-5628) Avail: AEC Depository Libraries

It is shown that in proportional multiwire chambers with the potentiometric readout, the accuracy of determining the coordinates of charged particles that are oblique to the wire plane is considerably higher than for particles that are transverse. This is due to the fact that obliquely falling particles are traveling through the working volumes of several wires, while the current of each wire is divided into two parts and is summed at the ends of the attenuator with the weight proportional to the wire number. For example, if the obliquely falling particles flies through the working volumes of three wires, the accuracy of determination of its coordinates may be + or − 0.05 of the interval between the separate wires. NSA

N71-30462# Ceskoslovenska Akademie Ved, Rez. Ustav Jaderneho Vyzkumu.

PRODUCTION OF CARRIER-FREE RADIOSTRONTIUM Sr 85

J. Hruby, V. Knobloch, B. Mudrova, and K. Svoboda Sep. 1970 70 p refs In CZECH

(UJV-2431-CH) Avail: AEC Depository Libraries

Studies undertaken in order to find optimal methods of Sr-85 production by irradiation in the U-120 cyclotron are described. Methods of irradiating rubidium in a suitable chemical form by deuterons, as well as methods of isolation of the radioisotope produced from the bulk amount of rubidium, its purification, and methods of impurity determinations are specified. The most suitable

way of target preparation proved to be layers rubidium chloride (the properties of the layer being improved by an addition of 2 to 4% of rubidium sulfate) melted in argon on copper or silver supporting discs. By preirradiational vacuum annealing of the targets their properties can be significantly improved. The most suitable method for separation of Sr from impurities is the chromatographic separation on the cation-exchange Dowex 50×8 in 0.8 M hydrochloric acid or 1 M ammonium acetate. The efficiency of the separation is about 95%. Polarographic methods of analysis adjusted for the determination of chemical impurities in the Sr-85 preparation, e.g., Cu, Zn, Cd, and Pb, are discussed. Author (NSA)

N71-30483# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
PROTON-RECOIL COUNTERS FOR THE MEASUREMENT OF FAST NEUTRONS: A BIBLIOGRAPHY, 1964–1970
Jean Geue, comp. Feb. 1971 14 p refs
(AAEC/LIB/Bib-270) Avail: AEC Depository Libraries

Eighty nine references are listed, covering the period April 1963 to 1970. Arrangement is alphabetical by author within each year. A reference to an abstract for each article is given. NSA

N71-30484# Institute of Nuclear Research, Warsaw (Poland).
COMPUTER PROGRAMME FOR ELABORATION OF Nd 148 MEASUREMENTS
A. Mikulski and T. Z. Zelenay 1970 19 p
(INR-1195) Avail: AEC Depository Libraries

Burnup of nuclear fuel may be determined by measuring the abundance of Nd-148, one of the stable fission products. After the separation and activation of Nd the spectrum of Nd-149 is examined using a multichannel gamma-ray spectrometer. The computer program NDM for the calculation of the area under the peaks was developed in algol for the GTER computer. Author (NSA)

N71-30485# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
AMPLITUDE AND CROSS SECTION OF THE COHERENT PRODUCTION OF STABLE AND UNSTABLE PARTICLES IN THE COLLISIONS OF FAST PARTICLES WITH NUCLEI
S. R. Gevorkyan, A. V. Tarasov, and Ch. Tseran 1971 15 p refs In RUSSIAN
(JINR-P2-5604) Avail: AEC Depository Libraries

The closed expressions for the amplitude of the coherent resonance production on nuclei with the account of the produced resonance widths are obtained. It is shown that at a certain energy range the account of the final resonance width changes essentially the cross sections. Author (NSA)

N71-30486# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ELECTROPRODUCTION OF PSEUDOSCALAR MESONS AT HIGH ENERGIES
N. A. Kobylinskii 1970 24 p refs In RUSSIAN; ENGLISH summary
(ITF-70-72) Avail: AEC Depository Libraries

A consideration is made of the processes of electroproduction of pseudoscalar mesons on nucleons at high energies. The behavior of terms of the differential cross section in the model is investigated taking into account poles and cuts. A number of consequences of the vector dominance model is also obtained. Author (NSA)

N71-30487# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
APPROXIMATIONS OF PAULI TYPE FOR VECTOR MESON WITH ANOMALOUS MAGNETIC MOMENT IN EXTERNAL FIELD
V. G. Kompaniets 1970 9 p refs In RUSSIAN
(IFVE-SVM-70-31) Avail: AEC Depository Libraries

The approximations of Pauli type for equations of Kemmer, Proc, and Corben–Schwinger describing vector particles with an anomalous magnetic moment are obtained. The equation of Taub equivalent to the scheme of Fierz–Pauli for the vector particles is considered. Author (NSA)

N71-30488# Scientific Research Inst. of Electro-Physical Apparatus, Leningrad (USSR).
TECHNIQUE FOR MEASURING PHASE CHARACTERISTICS OF AN ION BEAM [TEKHNIKA IZMERENIYA FAZOVYKH KHARAKTERISTIK IONNOGO PUCHKA]
M. A. Abroyan, V. P. Golubev, A. I. Solnyshkov, and G. V. Tarvid 1970 7 p refs In RUSSIAN; ENGLISH summary
(NP-18507; D-0103) Avail: AEC Depository Libraries

Devices are described which permit the measurement of phase characteristics of a beam by 4-slit and 2-slit methods. Four-dimensional volume is measured by the device, which photorecords the diaphragming beam with subsequent photometering. Emittance is measured by the device with electrical modulation the diaphragming beam. Author (NSA)

N71-30489# Amsterdam Univ. (Netherlands).
PROPERTIES OF THE DEFORMED NUCLIDES PRODUCED IN THE DECAY OF Ho 166, Ho 166m, Tm 166, Yb 166, Os 180, Re 180, Os 181, AND Os 181m, AND BY CAPTURE OF THERMAL NEUTRONS IN Ta 181
Peter Frank Arnold Goudsmit (Ph.D. Thesis) [1969] 151 p refs
(NP-18536) Avail: AEC Depository Libraries

After an introduction to the appropriate theoretical concepts, measurements on the decay of Ho-166, Ho-166m, and Tm-166 leading to Er-166 are discussed. Conversion coefficients and transition multipolarities are obtained, and special attention is directed to the properties of the gamma-vibrational and ground state bands and to identifying states above 1 MeV with the calculated two quasi-particle and collective excitations and with the members of their rotational bands. In the decay of Yb-166, only an upper limit on the intensity could be estimated for any possible transitions other than the 82.3-keV one. The properties of states in Re-180 and W-180 excited in the decay of OsV-180 and Re-180 were studied; they were consistent with theoretical predictions. Energy levels in Re-181, from the beta decay of Os-181, were examined. The spacing between certain odd-parity levels can be explained only if the rotation-particle coupling is taken into account. Finally, internal conversion in Te-182 was measured with a semiconductor detector situated outside the region of high gamma flux. NSA

N71-30497# California State Coll., Dominguez Hills.
THEORETICAL STUDY OF ELASTIC AND INELASTIC PION-C 12 SCATTERING AT INTERMEDIATE ENERGIES
H. K. Lee and H. McManus (Mich State Univ.) Dec. 1970 27 p refs Submitted for publication Supported in part by AEC Prepared in cooperation with Michigan State Univ.
(COO-1051-45) Avail: NTIS

Elastic and inelastic cross sections are computed using the distorted wave impulse approximation. The WKB method and a modified distorted wave code are compared. As input, pion-nucleon phase shifts, nucleon density from electron scattering, and microscopic inelastic form factors are used. It is found that the interaction given by the impulse approximation gives a fair fit to the elastic data and that the WKB approximation compares remarkably well with the distorted wave calculation at all but the lowest energies. The microscopic form factors of the 2(+) level at 4.4 MeV and 3(−) level at 9.6 MeV give a good account of the inelastic scattering. Discrepancies in the elastic scattering are similar to those observed in 1-GeV proton scattering from carbon. Author (NSA)

N71-30489# Tokyo Univ. (Japan). Inst. for Nuclear Study.
PROGRAM FOR ANALYSIS OF BUBBLE CHAMBER PHOTOGRAPHS
Hisataka Okabe, Fumio Ochiai, and Takeharu Konishi Aug. 1970 31 p refs In JAPANESE
(SJC-7-70-3) Avail: AEC Depository Libraries

A program for analysis of bubble-chamber photographs was developed to analyze the phenomenon of multi-particle formation, which is difficult by usual methods. In this program, the information of an average interval between bubbles is incorporated. The program has the following features: subprogram ARANGE is used to reduce the limitation of a measuring time and to minimize the determination process by an observer; and subprograms are introduced for correcting for the distortion of an image, which is a drawback of the image-plane type projector, and to check the mis-punches due to a noise in the measuring projector. NSA

N71-30514# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
DOCHAP: A FORTRAN 4 PROGRAM FOR THE CORRECTION AND CALIBRATION OF NEUTRON INELASTIC SCATTERING DATA
K. Krebs and D. J. Winfield 1971 42 p
(EUR-4599-e) Avail: AEC Depository Libraries

This program is used to correct raw data obtained from the Ispra-1 Double Chopper Neutron Spectrometer Facility. Corrections available are for background, air attenuation, detector efficiency, and sample thickness. In addition, the data may be normalized with spectra obtained from a vanadium reference specimen. A smoothing routine may also be utilized if the data have low statistical accuracy. The corrected data output is available in either punched, printed or graphical format. Author (NSA)

N71-30515# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
TOTAL PHOTOPRODUCTION CROSS SECTION OF HADRONS ON NUCLEI
V. Heynen, H. Meyer, B. Naroska, and D. Notz Feb. 1971 11 p refs
(DESY-71/5) Avail: AEC Depository Libraries

The total cross section for photoproduction of hadrons delta(gamma A) was measured on 7 nuclei (Be, C, Al, Ti, Cu, Ag, and Au) at 5.4 GeV photon energy. In addition the energy dependence of delta(gamma A) was measured for Be, C, and Ti between 1.5 and 5.7 GeV. A small shadow effect is observed which is in reasonable agreement with the prediction of the vector dominance model. Author (NSA)

N71-30526# Deutsches Elektronen-Synchrotron, Hamburg (West Germany).
PHOTOPRODUCTION OF VECTOR MESONS
Guenter Wolf Dec. 1970 67 p refs Presented at Symp. on Meson Photo and Electroproduction at Low and Intermediate Energies, Bonn, 21 Sep. 1970
(DESY-70/64; Conf-700948-2) Avail: AEC Depository Libraries

The experimental data on the reactions photon + proton yields proton + rho meson, photon + proton yields proton + omega meson, and photon + proton yields proton + phi meson are reviewed and compared with the vector dominance model predictions. NSA

N71-30527# Utrecht State Univ. (Netherlands).
THREE NUCLEON CALCULATIONS USING THE FADDEEV EQUATIONS
Rudi Malfliet (Ph.D. Thesis) 27 Apr. 1970 105 p refs
(NP-18678) Avail: AEC Depository Libraries

The Faddeev equations are solved by numerical integration, and the results are compared with those of other methods. The properties of the three nucleon system using simple local potentials are investigated to see whether some conclusions obtained for separable potentials remain valid. This includes a study of the influence of a repulsive core in the two particle interaction on the three particle bound state energy. Then, off-shell effects on three body observables are studied, together with an investigation of the sensitivity of these three particle observables to two particle data. Local potentials with tensor forces and soft cores are used. The binding energy, wave function, and doublet scattering length are calculated and discussed. NSA

N71-30534# Paris Univ., Orsay (France).
APPARATUS FOR HIGH RESOLUTION DETECTION OF CHARGED PARTICLES: APPLICATION TO STUDY OF THE 1st T = 2 STATE OF S 32 [ENSEMBLE A HAUTE RESOLUTION EN ENERGIE POUR LA DETECTION DES PARTICULES CHARGEES:. APPLICATION A LA RECHERCHE DU 1ST ETAT T = 2 DU S 32]
Sydney Gales (Ph.D. Thesis) 1970 64 p refs In FRENCH
(NP-18623) Avail: AEC Depository Libraries

The apparatus is an example of the use of developments in cooled high-resistivity surface-barrier junctions giving enhanced energy resolution. The equipment was used to study the first T = 2 state of S-32. The following reactions were investigated: P-31(proton,photon)S-32, P-31(proton,proton sub 1 photon)P-31, P-31(proton,proton sub 2 photon)P-31, P-31(proton,alpha sub 1 photon)Si-28, and P-31(proton,alpha sub 0)Si-28. In addition, the P-31(proton,proton sub 0)P-31 reaction at incident energies of between 3.150 and 3.300 MeV was studied. The resonance E sub p = 3.189 + or − 0.003 MeV possesses all the characteristics of the T = 2, S-32 level. NSA

N71-30535# International Centre for Theoretical Physics, Trieste (Italy).
COMPUTATION OF RENORMALIZATION CONSTANTS
Abdus Salam 1971 37 p refs Presented at Conf. on Fundamental Interactions at High Energy, Coral Gables, Fla., 20–22 Jan. 1971
(IC-71/3; Conf-710108-3) Avail: AEC Depository Libraries

The lecture covers analytic regularization methods and their applicability to nonpolynomial Lagrangians, and the effects of including quantized tensor gravity with the electrodynamics of leptons, that is the finite and gauge-invariant computation of the electron self-charge and self-mass in the quantum version of curved space and time. Also discussed is the suggestion that f mesons couple to the hadronic stress tensor in the same manner as Einstein gravitons do to leptons and the possibility of using this nonpolynomiality to regularize renormalization constants in strong interaction physics. NSA

N71-30536# Warsaw Univ. (Poland). Inst. for Theoretical Physics.
LOW, INTERMEDIATE, AND HIGH ENERGIES IN THE VENEZIANO MODEL FOR THE KN SCATTERING
Jozef Namyslowski, Zbigniew Rek, and Michal Swiecki Feb. 1970 22 p refs
(IFT-70/5) Avail: AEC Depository Libraries

The low energy constraints – consistency of two Adler – Weisberger sum rules, the Adler requirement, and the isospin-zero KN scattering length equal zero – are built in the Veneziano type model, with no unobserved parity doublets of particles with spin = 3/2, and no unobserved daughters of Y*(1382). Predictions of the uniquely defined KN amplitude are checked with the experimental data for the S11, P11, P13, and D13K(+)p phase shifts, the elastic widths of resonances, differential cross sections of the charge-exchange process K(+)n yields K(0)p, and the elastic backward K(+)p scattering, at energies ranging from threshold up to 12.3 GeV. A reasonable qualitative agreement is found at all energies. Author (NSA)

N71-30538# Chalmers Univ. of Technology, Goteborg (Sweden).
EXPERIMENTAL INVESTIGATIONS OF SOME TIME DEPENDENT PHENOMENA IN THE SLOWING DOWN AND DIFFUSION OF NEUTRONS
Gudmar Grosshoeg (Ph.D. Thesis) 1970 16 p refs Sponsored by Swed. at Res. Council
(INIS-mf-30) Avail: AEC Depository Libraries

Measurements were performed on the slow down time of Ra–Be neutrons from a source in water by a static method. An electronic system and methods for calculating, and data handling of precision measurements by the pulsed neutron source methods were developed. It was shown that decay constant variations and trapping effects were due to space dependence of the cross sections. An experimental method for eliminating this delay effect was investigated. Author (NSA)

N71-30539# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
OBTAINING THE LIMITING RELATIONS FOR CORRELATION AVERAGES
N. N. Jr. Bogolyubov 1970 16 p refs
(ITF-70-53) Avail: AEC Depository Libraries

The theorems necessary for obtaining many time correlation averages are formulated under some rather general auxiliary conditions. The technique proposed is valid for a wide class of model systems with four-fermion interaction. Author (NSA)

N71-30540# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
ION SOURCE WITH SOLID STATE WORKING SUBSTANCE
A. I. Vladimirov, V. A. Saenko, and Yu. P. Tret'yakov 1971 12 p refs In RUSSIAN
Avail: AEC Depository Libraries

The solid matter ion source is based on the plasma beam discharge. The working substance is obtained by evaporating with the aid of the electron beam generating the discharge. The discharge can be burnt in the material vapors of any conductivity in a wide range of the melting points. The source was tested with W, Mo, CaCO3, Si, and Zn. Author (NSA)

N71-30541# Rensselaer Polytechnic Inst., Troy, N.Y.
MeV TOTAL CROSS SECTION PROGRAM AT RPI
P. Stoler, P. F. Yergin, J. C. Clement, C. G. Goulding, and R. Fairchild 1971 7 p refs Presented at the 3d Neutron Cross Sections and Technol. Conf., Knoxville, Tenn., 15–17 Mar. 1971
(Contract AT(30-1)-328)
(RPI-328-221; Conf-710301-9) Avail: NTIS

The MeV neutron total cross section program at the Rensselaer Linac is described, and the results of some of measurements on H, Na-23, and Ni-60 are indicated. Author (NSA)

N71-30542# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
MICROWEIGHING AS AN IMPORTANT SOURCE OF ERROR IN ACTIVITY MEASUREMENTS [LA MICROPESEE, SOURCE IMPORTANTE D'ERREUR EN METROLOGIE D'ACTIVITE]
Yves Le Gallic Mar. 1971 30 p refs In FRENCH
(CEA-R-4169) Avail: AEC Depository Libraries

Errors arising in microweighing are greater than generally believed. A comparison was made between the microbalances belonging to three international laboratories. The sources of error observed were inaccuracies in the set of microbalance weights, incorrect setting of the sensitivity adjustment, and non-linearity of the optical scale. It appears that an accuracy superior to 0.2 or 0.3 per cent cannot be expected when weighing a 20 mg mass on a commercial microbalance. Certain discrepancies between international intercomparisons of activity measurements may be explained by these observations. Author (NSA)

N71-30543# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
COMPARISON OF EXPERIMENTAL RESULTS ON MESON PRODUCTION IN pp COLLISIONS AT 660 MeV WITH THE OPE MODEL PREDICTIONS
R. Ya. Zulkarneev, B. M. Ovchinnikov, N. A. Poltavskaya, and O. Ya. Fedorov 1971 13 p refs In RUSSIAN
(JINR-P1-5571) Avail: AEC Depository Libraries

The results of experimental studies of the proton,proton yields positive pion,neutron,proton and neutral pion,proton,proton reactions in the 600 to 660 MeV region are compared with the predictions of the Sellery meson-production model. A qualitative agreement with the experimental data is found. Author (NSA)

N71-30544# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
LIQUID NITROGEN CRYOSTAT FOR keV HEAVY-ION IRRADIATION EXPERIMENTS
D. A. Channing Jul. 1970 8 p refs Submitted for publication
(RD/B/M-1753) Avail: AEC Depository Libraries

A liquid nitrogen cryostat is described for keV heavy ion irradiation and isochronal annealing of specimens between 77 and 300 K. Temperatures are readily stabilized to better than + or – 1K and, in anneals, the rise and fall times from and to the reference temperature, 77 K, range up to 10 min and 7 min respectively. Access to the specimen is specifically provided for Mossbauer spectroscopy. Author (NSA).

N71-30545# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
DUAL RESONANCES MODELS. 1 Review
L. L. Jenkovszky, V. V. Kukhtin, and V. P. Shelest 1970 51 p refs In RUSSIAN
(ITF-70-43) Avail: NTIS

The origin, properties, some applications and possible generalizations of dual resonance models are reviewed. Author (NSA)

N71-30546# Lund Univ. (Sweden). Dept. of Physics.
PHOTOPRODUCTION OF CHARGED PIONS FROM NUCLEI
I. Blomqvist, G. Nydahl, and B. Forkman Apr. 1970 31 p refs Prepared jointly by Lund Univ. and Lund Inst. of Tech., Dept. of Nucl. Phys.
(LUNP-7007) Avail: AEC Depository Libraries

The yields of the reactions K-41(photon,positive pion)Ar-41, Cu-65(photon,positive pion)Ni-65, Sr-88(photon,positive pion)Rb-88, and Ba-88(photon,positive pion)Cs-88 were measured by activation analysis. Data on the reactions B-11(photon,negative pion)C-11, Al-27(photon,positive pion)Mg-27, and V-51(photon,positive pion)Ti-51 obtained earlier were also analyzed. The experimental cross sections are compared with predictions from simple model calculations. Author (NSA)

N71-30547# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ELECTRODISINTEGRATION OF LIGHT NUCLEI
A. G. Sitenko, A. A. Pasichnyi, and V. K. Tartakovskii 1970 19 p refs In RUSSIAN; ENGLISH summary
(ITF-70-35) Avail: AEC Depository Libraries

The electrodisintegration of nuclei, that is, the inelastic electron scattering process accompanied by knocking out of nucleons is discussed. The case of ultrarelativistic electrons and light nuclei is considered. The Coulomb and magnetic interaction between the electron and nucleons is taken into account. As the wave functions for the primary and finite states of nucleons, the exact solutions of Schroedinger's equation with the Woods–Sakson real self-consistent potential are used. The numerical calculations of the electrodisintegration differential cross section for nucleus C-12 are

performed. An investigation is made of the role of the nucleon wave deformation effects in the finite state. It is shown that by the calculations on the basis of the shell model with the real potential it is possible to obtain an agreement with experimental data both with respect to the maxima positions and the momentum distributions shapes under the electrodisintegration of light nuclei. The electron energy spectra inelastically scattered by light nuclei are calculated. The calculated spectra well agree with experimental data. Author (NSA)

N71-30548# Atomic Energy Commission Research Establishment, Riso (Denmark).
SYNTRON: A THREE-DIMENSIONAL FLUX SYNTHESIS PROGRAMME
Hans Larsen Jan. 1971 33 p refs
(RISO-M-1346) Avail: AEC Depository Libraries

A description is given of the program SYNTRON, which is a three dimensional variational single channel flux synthesis code. Besides the actual synthesis, the program contains a subroutine for calculation of the two dimensional expansion functions by use of ordinary difference equation technique. Author (NSA)

N71-30549# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
SOLUTION OF THE UNITARY CONDITION FOR THE SPIN PARTICLE SCATTERING AMPLITUDE
V. I. Savrin, N. E. Tyurin, and O. A Khrustalev 1970 17 p refs In RUSSIAN
(IFVE-STF-70-1) Avail: AEC Depository Libraries

On the basis of the unitary conditions, the high energy elastic scattering amplitude of a scalar particle on 1/2 spin particle is calculated. The formula for polarization of a spinor particle is presented. Author (NSA)

N71-30550# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
BIBLIOGRAPHY ON ISOTOPE SEPARATION BY ION EXCHANGE
D. E. J. Garman, comp. (Sydney Univ.), P. M. Beach, comp., J. J. Fardy, comp., E. A. Newland, ed., and P. K. Williamson, ed. (Sydney Univ.) Nov. 1970 33 p
(AAEC/LIB/Bib-273) Avail: AEC Depository Libraries

One hundred ninety-two references are listed, covering the period 1938 to 1970, and arranged alphabetically by author within a chronological listing by year. References are given to an abstract for each article. NSA

N71-30551# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
KNOCKING OUT OF NUCLEONS FROM LIGHT NUCLEI UNDER THE INELASTIC SCATTERING OF HIGH ENERGY ELECTRONS
A. A. Pasichnyi 1970 25 p refs In RUSSIAN; ENGLISH summary
(ITF-70-42) Avail: AEC Depository Libraries

An investigation is made of the shell structure of light nuclei under the inelastic scattering of high energy electrons accompanied by knockout of a nucleon from the nucleus. The distortion of the nucleon and the residual nucleus is taken into account. The nucleon momenta distributions in different shells of the nuclei C-12, O-16, and Ca-40 are investigated. The influence of the interaction of the nucleon and nucleus in the final state on the electron distribution over the angles and energies in coincidence experiments is shown. The allowance for the distortion effect results in improving the agreement of theory and experiment when studying the knockout of protons from the different shells of C-12 in coincidence experiments, as well as in experiments on the investigation of the continuous spectrum of the nonelastically scattered high energy electrons. Author (NSA)

N71-30552# Tokyo Univ. (Japan). Inst. for Nuclear Study.
MESON RESONANCES AS OBSERVED IN anti pp ANNIHILATIONS
L. Montanet Mar. 1970 108 p refs
(SJC-P-70-1) Avail: AEC Depository Libraries

This is a review on meson resonances as observed in anti p,p annihilations. The properties of several meson resonances were analyzed in some detail. As is shown by these analyses, one of the advantages of anti p,p annihilations which is very useful for a detailed analysis of the final states is that the anti p,p annihilations at rest occur in well defined states 1S sub 0 and 3S sub1. Author (NSA)

N71-30559# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
DEFINITION OF QUASI-AVERAGES
N. N. Bogolubov, Jr. 1970 20 p refs In RUSSIAN; ENGLISH summary Presented at Seminar on the Theory of Elementary Particles, Kiev
(ITF-70-58-P) Avail: AEC Depository Libraries

Some difficulties connected with definition of quasi-averages for the model systems with a negative four-fermion interaction are considered. A new method of introducing the auxiliary system and definition of quasi-averages is developed. At the same time the problem of limiting expressions for the free energy is solved. Author (NSA)

N71-30561# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
PECULIARITIES OF APPLICATION OF THE LIE GROUP THEORY TO THE NON-RELATIVISTIC TRANSFORMATIONS
V. N. Streltsov 1971 6 p refs In RUSSIAN
(JINR-P2-5625) Avail: AEC Depository Libraries

The peculiarities of application of the Lie group theory to the case of nonrelativistic transformations are discussed. Author (NSA)

N71-30563# Paris Univ. (France). Faculte des Sciences.
STUDY OF THE ANNIHILATIONS ANTIPROTON PROTON YIELDS 2 PION(+) PION(−) (PION(0)) AT 3.6 GEV/C|
Josette Debray (Ph.D. Thesis) 1970 71 p refs In FRENCH
(NP-18730) Avail: AEC Depository Libraries

The mass spectra of the antiproton proton annihilations into 4 or 5 pions at 3 GeV/c were studied. The cross sections for the production of the rho, f(0), and omega(0) resonances in the annihilations antiproton proton yields 2 pion(+) 2 pion(−) and the effective mass spectrum of the pion(+) pion(−) in the final state were derived. A bump appeared between 1500 and 1700 MeV and it was attributed to the g(1660) meson. Final states in which two resonances are produced were shown to exist; 25% of the final states in the antiproton proton yields 2 pion(+) 2 pion(−) reaction consist of two resonant pion pion systems; 21% of the final states in the antiproton proton yields 2 pion(+) 2 pion(−) pion(0) reaction are three-body systems among which two resonances were found. A search for heavy resonances was made, and significant evidence of the existence of objects with high masses decaying into three or four pions was obtained. The experimental data were compared with the predictions of the multi-Regge CHAN model. NSA

N71-30566# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ASYMPTOTIC PROPERTIES OF THE ELECTRON-PROTON SCATTERING AMPLITUDE AND THE SUM RULES FOR THE SCHWINGER TERM

V. A. Miranskii and G. M. Zinovev 1970 6 p refs
(ITF-70-73) Avail: AEC Depository Libraries

A connection is established between the asymptotic behavior of the electron–proton scattering amplitude, the Jost–Lehmann–Dyson (JLD) spectral function of the commutator of currents, and the sum rules for the Schwinger term. It is shown that the restrictions on the JLD spectral function are less rigorous than those resulting in the property of the scale invariance of the scattering amplitude. Author (NSA)

N71-30568# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
SU(4). IS IT A PLAUSIBLE SYMMETRY FOR HADRONS?
L. Maiani 30 Jun. 1970 16 p refs Presented at the Intern. School of Subnucl. Phys., Trapani, Italy, 1–19 Jul. 1970
(ISS-70/16; Conf-700714-1) Avail: AEC Depository Libraries

A theory of weak interactions is presented based on approximate SU(4) invariance of strong interactions. The theory has a pattern of divergences different from the conventional one. In particular transitions with delta S = 1 neutral currents are of order G(2) + G(3)lambda(2) + ... and not G(2)lambda(2) + G(3)lambda(4) + ... as in the conventional one, and the same is true for the K sub S – K sub L mass difference. A neutral current with delta S = 0 can be introduced, and leads to a more symmetrical formulation of the theory, in terms of Yang–Mills fields. The presence of this neutral current can be detected in neutrino experiments, and its predicted strength is compatible with present experimental upper bounds. Consequences of the theory for strong interactions are briefly discussed. Author (NSA)

N71-30569# Paris Univ., Orsay (France). Lab. de l'Accelerateur Lineaire.
STUDY OF THE COHERENT PRODUCTION ON NUCLEI OF THE KAON(–) PION(+) PION(–) SYSTEMS BY THE KAON(–) OF 5.5, 10.0, AND 12.7 GeV/c [ETUDE DE LA PRODUCTION COHERENTE SUR NOYAU DU SYSTEME KAON(NEGATIF) PION(POSITIF) PION(NEGATIF) PAR DES KAON(NEGATIF) DE 5,5; 10,0 ET 12,7 GeV/c]
D. Fournier (Ph.D. Thesis) Dec. 1970 236 p refs In FRENCH
(LAL-1242) Avail: AEC Depository Libraries

The results of a study of the coherent production of the negative kaon,positive pion,negative pion system on the nuclei of neon, carbon, fluorine, and bromine are described. Negative kaons of momenta 5.5, 10.0, and 12.7 GeV/c are exposed to the nuclei in three bubble chamber experiments. The properties of the negative kaon,positive pion,negative pion system including the spin, parity, approximate mass, and density matrix elements are studied. The amplitudes of the decay of this system are also found. The total cross sections for the interactions of this coherent meson system with nucleons are studied in these experiments. NSA

N71-30570# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
CHARACTERISTICS OF SECONDARY PARTICLES EMITTED IN PION(+) Xe COLLISIONS AT 2.34 GeV/c
B. Slovinskii and Z. S. Strugalskii 1971 17 p refs In RUSSIAN
(JINR-P1-5592) Avail: AEC Depository Libraries

The effective masses of different pairs of particles: gamma-quanta, positive pion sub 0 and protons, emitted in positive pion, xenon interactions at 2.3 GeV/c, were studied. The angular and momentum distributions of protons, emitted in these reactions, are presented. Author (NSA)

N71-30571# Paris Univ. (France). Faculte des Sciences.
SEARCH FOR CLASSES IN MAGNETIC QUADRUPOLE GAMMA TRANSITIONS [RECHERCHE DE CLASSES DANS LES TRANSITIONS GAMMA QUADRUPOLAIRES MAGNETIQUES]
Jocelyne Letessier (Ph.D. Thesis) 14 May 1970 112 p refs In FRENCH
(NP-18492) Avail: AEC Depository Libraries

A limited number of transitions is known with certainty; an attempt was made to increase this number in order to find out whether distinct classes of M2 transitions existed and to relate these classes to certain nuclear properties. Automatic angular correlation measuring equipment was developed, and two methods were used to measure mean lives ranging from some dozens of picoseconds to a few microseconds. One method involved using a time-amplitude converter; and the other, variable electronic delay-time techniques. In order to realize what were the limitations to the measurements of the weak proportions of E2 or M2 in the transitions M1 + E2 or E1 + M2, the 329 keV Ce-40 transition was studied in detail. Most of the endeavors to detect M2 transitions were unsuccessful; however, fortuitously certain transitions led to the establishment of about twenty nuclear level schemes. Eighty-three M2 transitions which could be analyzed were found, and the periodicity of the forbidden transitions was already apparent. Author (NSA)

N71-30572# Atomic Energy of Canada, Ltd., Pinawa (Manitoba).
PHASE TRANSFORMATION OF HYPERSTOICHIOMETRIC URANIUM CARBIDE
N. Oi Dec. 1970 26 p refs
(AECL-3679) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $0.50

Hyperstoichiometric UC fuels (4.85–5.31 wt % C) were found to have undergone a phase transformation during irradiation. Electron micrographs showed the formation of a spherical U2C3 phase at the UC2 platelets. The formation of U2C3 was found to be extensive in fuel specimens irradiated at higher temperatures, and a partial phase transformation was also found in a fuel speciman irradiated at < 800C. No fission gas bubbles were observed in specimens where phase transformation had occurred. The phase transformation increases the fuel density. Annealing experiments on transformed carbide specimens were carried out at 1200 to 1450 C for 3 hours. It was found that the presence of U2C3 spheres markedly enhances dimensional stability; few or no fission gas bubbles were observed irrespective of carbon content of the specimens. The tentative suggestion here is that the solubility of fission gases in U2C3 is higher than in UC or UC2 and that U2C3 absorbs any excess fission gas atoms present in the UC and UC2 phases. Author (NSA)

N71-30573# Ludwig-Maximilians-Universitat, Munich (West Germany).
ECCENTRICITY EFFECTS IN THE ABSOLUTE DETERMINATION OF ALPHA-EMITTERS IN ACUTE ANGLE COUNTERS [EXZENTRIZITAETSEFFEKTE BEI DER ABSOLUTBESTIMMUNG VON ALPHA-STRAHLERN IN KLEINWINKELZAEHLERN]
Wilhelm Kampf (Ph.D. Thesis) 1970 115 p refs In GERMAN
(NP-18664) Avail: AEC Depository Libraries

In the use of the small angle counter (low geometry counter) for the absolute determination of alpha emitters, the lateral displacement of the sample from the central site causes corresponding changes in the counting rate. The eccentricity effects caused by such a displacement are studied. A counting device was constructed which permits a reproducible radial displacement of the sample and its measurement. The pertinent mathematical expression of the modified theory of the low geometry counter was rederived and numerically proved. NSA

N71-30574# Grenoble Univ. (France).
STUDY OF THE DECAY OF THE 16.11-MeV LEVEL OF C 12 INTO 3 ALPHA PARTICLES [CONTRIBUTION A L'ETUDE DE LA DESINTEGRATION EN 3 ALPHA DU NIVEAU DE 16,11 MEV DU C 12]

Dy-Holm Kong-A-Siou (Ph.D. Thesis) 1970 83 p refs In FRENCH
(NP-18626) Avail: AEC Depository Libraries

Accurate measurements were made on the disintegration spectra of the C-12 nucleus into 3 alpha particles. In order to suppress normalization problems, three parametric spectra were simultaneously measured. The coincidence methods were used. The use of an IBM 360-50 disc memory allowed the results obtained to be treated under the best conditions. In the analysis of the experimental results, maximum use was made of the known experimental data (partial disintegration widths, (alpha-alpha) scattering phase shifts); and a minimum number of parameters was introduced. In general, the form of the experimental spectra was good for the angular momentum 1 = 2 relative to the alpha-Be-8 channel. The variation in the population of the Dalitz domain, closely linked to the entry channel, is compatible with a significant contribution of the S = 1 spin channel of the entry channel. However, the contribution of the S = 2 spin channel is not zero-(channel S = 1)/(channel S = 2) = 5. The sequential reaction hypothesis (a single interaction in the final state) led to a satisfactory interpretation of the experimental results. NSA

N71-30575# Scientific Research Atomic Reactor Inst., Melekess (USSR).
METHODS OF RADIOCHEMICAL DETERMINATION OF PLUTONIUM, AMERICIUM, CURIUM, CALIFORNIUM, BERKELIUM, AND FISSION PRODUCTS IN IRRADIATED MATERIALS [METODIKI RADIOKHIMICHESKOGO OPREDELENIYA PLUTONIYA, AMERITSIYA, KYURIYA, KALIFORNIYA, BERKLIYA I PRODUKTOV DELENIYA V OBLUCHENNYKH MATERIALAKH]
Yu. I Gryzin, V. V. Gryzina, B. I. Levakov, and P. A. Privalova 1970 28 p refs In RUSSIAN
(SRARI-P-81) Avail: AEC Depository Libraries

Methods are presented for the radiochemical determination of plutonium, americium, curium, californium, berkelium, and nuclear fuel fission products: cerium, rare earths, zirconium, niobium, ruthenium, strontium, and cesium. For all the above elements both express-extraction and universal-precipitation methods are given. Author (NSA)

N71-30617# Japan Atomic Energy Research Inst., Tokyo.
THERMAL NEUTRON SCATTERING FROM SIMPLE LIQUID METALS
Yasuaki Nakahara Oct. 1970 84 p refs
(JAERI-Memo-4191) Avail: AEC Depository Libraries

A new phenomenological method is proposed to calculate double differential scattering cross sections for thermal neutron scattering from simple monatomic liquid metals such as liquid sodium. A general expression for coherent part of the cross section was obtained from a system of classical Vlasov equations (collisionless kinetic equations) for fully ionized ions and electrons interacting with each other through Coulomb or effective potentials. An effective potential is derived using the second moment theorem for the scattering law S(k, omega). The Coulomb and effective potentials give almost the same S(k, omega). A comparison between ion-electron model and Nelkin-Ranganathan's neutral atom model shows that the explicit consideration of charges of ions and the existence of conduction electrons gives an excellent improvement. The gross structure of the reduced scattering law is determined by incoherent scattering. The incoherent part of the scattering law was calculated with the GASKET/J code. The calculated S sub R(k, beta) for liquid sodium shows an excellent qualitative and quantitative agreement with experimental values, except for beta's around 1.0. NSA

N71-30618# Lyon Univ. (France). Inst. de Physique Nucleaire.
[NUCLEAR PHYSICS] Annual Report for 1969 [PHYSIQUE NUCEAIRE Rapport Annuel, 1969]
Jan. 1970 134 p refs In FRENCH
(LYCEN-7002) Avail: AEC Depository Libraries

Research at the Nuclear Physics Institute at the University of Lyon in 1969 is summarized. The work included spectroscopic studies of nuclear structure, radiochemical studies of nuclear reactions, development of nuclear instrumentation, and theoretical studies in high-energy nuclear physics. NSA

N71-30622# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
EIKONAL SCATTERING AMPLITUDE IN SOME MODELS OF FIELD THEORY AT HIGH ENERGIES
B. M. Barbashov and V. V. Nesterenko 1971 25 p refs In RUSSIAN
(JINR-P2-5577) Avail: AEC Depository Libraries

High-energy scattering of particles in some models of field theory is considered as well as the possibility of the amplitude representation in the eikonal form. Author (NSA)

N71-30623# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
ON THE REPRESENTATION OF THE JOST-LEHMANN-DYSON TYPE
V. S. Vladimirov and V. V. Zharinov 1970 25 p refs
(ITF-70-33) Avail: AEC Depository Libraries

The integral representation is obtained for functions holomorphic in tube domains over arbitrary proper cones C and -C and in a neighborhood of a real n-divided open set phi, and belonging to the algebras H(C) and H(-C). As an application the corresponding Jost-Lehmann-Dyson type representation is derived. Reported at the Seminar of the Department of Mathematical Methods in Theoretical Physics. Author (NSA)

N71-30624# Centro Informazioni Studi Esperienze, Milan (Italy).
BETA DETECTION EFFICIENCY CURVES FOR K 40, Y 90, Sr 90-Y 90, Cs 137, Ce 144-Pr 144, Pm 147, Eu 155, Tl 204 IN SOURCES OF DEFINITE CHEMICAL FORM AS A FUNCTION OF THEIR THICKNESS [CURVE DI EFFICIENZA PER BETA EMETTITORI (K 40, Y 90, Sr 90-Y 90, Cs 137, Ce 144-Pr 144, Pm 147, Eu 155, Tl 204) IN SORGENTI DI FORMA CHIMICA DEFINITA, IN FUNZIONE DELLA SPESSORE]
A. Battaglia, G. Bonfanti, and C. Triulzi Sep. 1970 36 p refs In ITALIAN; ENGLISH summary
(CISE-N-119) Avail: AEC Depository Libraries

Beta detection efficiency curves for some radionuclides of interest (K-40, Y-90, Sr-90 + Y-90, Cs-137, Ce-144 + Pr-144, Pm-147, Eu-155, and Tl-204) contained in sources of a suitable material and with a superficial density ranging from 3 to 110 mg sq cm are reported. They were experimentally drawn by measuring reference sources in different geometries by means of three G-M window detectors (one of low background) and of a 2 pi flow proportional counter. These curves have been used to determine such radionuclides in different thickness sources obtained by specific radiochemical separations carried out on various environmental samples. Author (NSA)

N71-30636# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
NONEXISTENCE OF AMBIGUITIES IN SU(3) x SU(3) BREAKING
K. T. Mahanthappa and L. Maiani 15 Oct. 1970 8 p refs
(ISS;70/25) Avail: AEC Depository Libraries

It is shown that a careful treatment of symmetry breaking of SU(3) cross product SU(3) does not lead to any ambiguity in the determination of the (3,3bar) cross product (3bar,3) breaking lagrangian, contrary to the result of Kuo. Author (NSA)

N71-30637# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ALGEBRAIC REALIZATION OF CHIRAL SU(3) x SU(3) SYMMETRY
V. I. Ogievetskii 1971 28 p refs In RUSSIAN
(JINR-P2-5692) Avail: AEC Depository Libraries

The algebraic realization of the nonlinear chiral, SU(3) × SU(3) symmetry which is linear only on its good isospin hypercharge subgroup SU(2) × Y is considered.it is shown that particles of any given helicity must be assembled into supermultiplets of chiral SU(3) × SU(3). At the same time the mass squared matrix sq m is proven to contain besides the invariant part the eighth and zero components the (3,3*) + (3*,3) representation of SU(3) × SU(3) in accordance with the Gell-Mann–Oakes–Renner hypothesis. Also some additional restrictions on sq m are derived. Author (NSA)

N71-30638# National Radiation Lab., Christchurch (New Zealand).
[RADIOACTIVITY MONITORING AND SAFETY ACTIVITIES] Annual Report, 1969
1970 41 p refs
(NP-18529; NRL-AR-20) Avail: AEC Depository Libraries

The radiation protection program of the National Radiation Laboratory, New Zealand, is outlined and activities during 1969 are reported. The Laboratory is responsible for the administration of radiation protection legislation governing all users of radiation, provides assistance in the field of radiation physics, and maintains standards for the calibration of X-ray sources and other radiation sources. A film badge dosimetry service is provided for monitoring all personnel occupationally exposed to radiation. Training courses are given to groups of professional and technical workers in New Zealand and assistance is being given to Thailand in setting up a National Radiation Protection Service. The Laboratory is responsible for monitoring fallout in New Zealand and adjacent Pacific Ocean locations. NSA

N71-30639# Hebrew Univ., Jerusalem (Israel). Dept. of Theoretical Physics.
SHELL MODEL ANALYSIS OF LAMBDA HYPERON BINDING ENERGIES FOR THE p-SHELL HYPERNUCLEI. 1: BASIC FORMULAE AND MATRIX ELEMENTS FOR LAMBDA HYPERON NUCLEON AND LAMBDA HYPERON NUCLEON NUCLEON FORCES
A. Gal, J. M. Soper (Atomic Energy Res. Est., Harwell), and R. H. Dalitz (Oxford Univ.) 1970 121 p refs
(NP-18585) Avail: AEC Depository Libraries

A uniform intermediate-coupling shell model is formulated for the p-shell lambda hyperon hypernuclei by using NN parameters obtained from previous fits to the corresponding core nuclei. The physical origins of the Lambda hyperon N forces are discussed, with special attention to the non-central components, and the characteristics of the three-body double-OPE Lambda hyperon NN interaction are reviewed briefly. Expressions are derived for all the Lambda hyperon N and Lambda hyperon NN matrix elements needed for the discussion of these configurations. Attention is particularly drawn to their qualitative characteristics. For the purpose of orientation, numerical estimates of them are given for all the possible types of Lambda hyperon N force and for all the constituents of the double-OPE Lambda hyperon NN interaction, with explicit forms used for the radial wave functions. Author (NSA)

N71-30644# Institut fuer Strahlenschutz, Stohl (West Germany).
ABM SYSTEMS: NUCLEAR PHYSICAL ASPECTS [ABM-SYSTEME: KERNPHYSIKALISCHE ASPEKTE]
K. D. Leutheeuser and U. J. Roose Bonn Bundeswehramt 1971 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-71-2) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

The physical aspects of high-altitude nuclear explosions are investigated with respect to the qualification as Anti Ballistic Missile-systems. An aggressive nuclear weapon system will be damaged by a defensive nuclear burst in its proximity. In discussing the efficiency of each damage mechanism the following effects on the offensive nuclear weapon systems have to be considered: (1) influence of nuclear radiation (gamma rays and neutrons) on electronics and the nuclear device, (2) mechanical damages caused by thermal radiation and the expansion of the fireball. The corresponding destruction radii are estimated. An upper limit of some kilometers seems to be reasonable for the most relevant damage mechanisms. Author (ESRO)

N71-30651# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
DETERMINATION OF THE DELTA T = 7/2 TRANSITION IN THE KAON YIELDS 3 PION DECAY
L. G. Dakhno and A. K. Likhoded 1970 8 p refs In RUSSIAN
(IFVE-STF-70-14) Avail: AEC Depositories

A method is proposed to determine experimentally the Delta T = 7/2 transition in the kaon yields 3 pion decay. Author (NSA)

N71-30652# Warsaw Univ. (Poland). Inst. for Theoretical Physics.
WEAK PROCESS PION(+) PROTON YIELDS KAON(+) PROTON
Marek Kolanowski Mar. 1970 6 p refs
(IFT-70/6) Avail: AEC Depository Libraries

An estimate is made for the contribution of the weak interaction pion(+) proton yields kaon(+) proton to the two-body pion(+) proton scattering. The pole model was used for the calculation of the cross section of the weak process. The result is sigma(W)/sigma(EL) approximately = 0.75 × 10 to the minus 10th power near the threshold for the weak reaction. Author (NSA)

N71-30654# Bhabha Atomic Research Centre, Bombay (India).
KINETICS OF RELEASE OF XENON FROM SINTERED (Th-O2-0.1 PERCENT UO2) PELLETS
M. D. Karkhanavala, M. C. Naik, K. N. G. Kaimal, and O. P. Chawla 1971 28 p refs
(BARC-513) Avail: AEC Depository Libraries

Post-irradiation thermal release of fission Xe-133 from ThO2–0.1% UO2 pellets of different sintered densities was studied in the temperature range 200 to 1250 C. The initial burst release f sub 0 and apparent diffusivity D' decreased considerably in the case of 90% TD pellets, which showed an abnormal increase in the closed porosity and sharp decrease in the open porosity. Arrhenius plots log D' VS 1/T for the steady state release of Xe-133 from 67 and 79% TD pellets are linear below 600 C and above 800 C but exhibit nonlinearity in the range 600 to 800 C. The apparent activation energies in the temperature range 400 to 600 C are 5.5 and 8.8 kcal/mole for 67 and 79% TD pellets, respectively. The value for the high temperature range (> 800 C) are 46.8, 49, and 58 kcal/mole for 67, 79, and 90% TD pellets, respectively. Initial burst release was found to be dependent on the density and specific surface area of the pellets and the temperature. Possible mechanism of release is discussed. Author (NSA)

N71-30655# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
QUASIPOTENTIAL EQUATION FOR PARTICLES WITH SPIN 1/2 IN THE CONFIGURATION REPRESENTATION AND THE RELATIVISTIC SPHERICAL SPINORS
M. D. Mateev, R. M. Mir-Kasimov, and N. B. Skachkov 1971 20 p refs In RUSSIAN
(JINR-P2-5805) Avail: AEC Depository Libraries

The quasi-potential equation describing the interaction of

particles with spin 1/2 and 0 is considered. The matrix elements of the principle series of the Lorentz group unitary representations are used to introduce relativistic spherical spinors and perform a transition to the configurational representation. Author (NSA)

N71-30685# Paris Univ., Orsay (France).
PARTICLE DYNAMICS IN THE ORSAY HEAVY ION LINEAR ACCELERATOR, ALICE: FOCUSING AND ACCELERATION [DYNAMIQUE DES PARTICULES DANS L'ACCELERATEUR LINEAIRE A IONS LOURDS D'ORSAY, ALICE: FOCALISATION ET ACCELERATION]
Charles Goldstein (Ph.D. Thesis) 1970 107 p refs In FRENCH
(NP-18612) Avail: AEC Depository Libraries

The work done using the heavy ion linear accelerator in conjunction with the ALICE project is presented. The geometrical characteristics of the accelerator and its grid focusing system were determined using the method; a calculation already applied to the Berkeley grid. The limiting factors in the calculation are indicated. The technological parameters of the Orsay grid are defined: temperature and transparence. The tests carried out on the mock-up are described. The program concerning the dynamics of the particles, which explains the characteristics of the extracted beam, is described. Using measurements of potential made in the electrolytic tank, the assembly of electric fields of the accelerator was simulated and the motion of the particles studied by integrating their equations of motion using the Runge-Kutta method. The electric field was measured in two planes of symmetry and the calculations made in only one plane. The MORAD program developed for this study is presented. NSA

N71-30672# Central Electricity Generating Board, Berkeley (England). Berkeley Nuclear Labs.
RADIATIONS FROM CAGR FUEL: ALPHA-ACTIVITY, BETA-HEATING, GAMMA-SPECTRA, AND NEUTRON EMISSION
S. M. Beynon and R. H. Clarke Jan. 1971 26 p refs
(RD/B/N-1887) Avail: AEC Depository Libraries

Calculations were performed to obtain the heavy element content and fission product inventory in typical CAGR fuel. The alpha activity and beta-heating were calculated as a function of cooling time after irradiation. The gamma-spectrum from the fuel was determined for the two basic gamma-spectra available that cover all the nuclides within the fuel and the results are compared. The neutron production rates within the fuel from both spontaneous fission and (alpha,n) reactions on oxygen were also estimated. Author (NSA)

N71-30674# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
A GENERALIZED VENEZIANO MDEL
V. A. Miranskii, V. P. Shelest, and G. M. Zinov'ev 1970 8 p refs
(ITF-70-78) Avail: AEC Depository Libraries

It is shown that from the generalized Veneziano model one can construct the amplitude with a finite number of daughter Regge trajectories which corresponds to the generalized interference model. Author (NSA)

N71-30679# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
ON THE ep SCATTERING AMPLITUDE STRUCTURE IN e SUP 2 AND e SUP 4 APPROXIMATIONS
A. P. Vanzha and A. V. Tarasov 1971 11 p refs In RUSSIAN; ENGLISH summary
(JINR-P2-5629) Avail: AEC Depository Libraries

The spin structure of the two-photon exchange contribution to the ep elastic scattering amplitude was investigated. Using an equation for such a contribution it is easy to find that only odd products of the Dirac matrices are sandwiched between electron spinors. The direct computing of such matrix elements shows that the amplitude of transitions with changing electron helicity vanish, if the ratio of the electron mass to its energy is neglected. For the one-photon exchange amplitude the same statement is given. Under all general invariance assumptions the full ep scattering amplitude without the electron helicity change contains only three independent spin structures. To determine all two-photon exchange contributions to the ep scattering amplitudes, measurements using the polarized beam and target in e(+)p and e(−)p scattering are necessary. The expressions for polarization tensors in this case are given. Author (NSA)

N71-30691# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
NEW ISOTOPE RU 92
R. Arl't, B. Bayar, N. G. Zaitseva, B. Kratsik, A. F. Novgorodov et al 1971 6 p refs In RUSSIAN
(JINR-P6-5594) Avail: AEC Depository Libraries

Several experiments were carried out in search for the Ru-92 isotope. The Ag samples were irradiated by 660 MeV protons for 3 to 5 minutes and transferred along the pneumatic system into the preheated oven for Ru element fraction extraction; gamma spectra were then measured for a number of equal time intervals using a 38-sq m Ge(Li) detector with a resolution of about 3.6 keV at the 662-keV Cs-137 line and recorded for the further evaluation. The decay of selected lines in Tc-92 was investigated. They were compared with those in the Tc fraction, which was measured for comparison under the same conditions along with the Ru fraction. According to the growth and decay of the daughter Tc-92 lines, the half life of Ru-92 was determined to be (2.5 + or − 1) min. Author (NSA)

N71-30692# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
INTERPOLATIVE FORMULAE FOR AVERAGE NUCLEAR LEVEL SPACING AND TOTAL RADIATION WIDTH
A. R. de L. Musgrove Nov. 1970 46 p refs
(AAEC/E-211) Avail: AEC Depository Libraries

The free-gas model formula for nuclear level densities was used to interpolate unknown level spacings. The level density parameter was fitted semi-empirically to give good fits to all experimentally measured level spacings. A formula for total radiation width is given which relates this quantity to the mass number, the average level spacing and the excitation energy. Compound nuclei which have a long lived isomeric state were found to have, on average, a radiation width 25 percent less than for non-isomeric compound nuclei. No correlation between radiation widths and neutron strength function was observed within the limits of accuracy of the experimental data, contrary to some previous suggestions. Tables of calculated and measured resonance parameters are given for target nuclei in the range 60 < A < 203. Author (NSA)

N71-30693# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Neutron Physics.
U 238 NEUTRON RESONANCE RADIATION WIDTHS
Kh. Maletski, L. B. Pikel'ner, I. M. Salamatin, and E. I. Sharapov 1971 10 p refs In RUSSIAN
(JINR-P3-5609) Avail: AEC Depository Libraries

The radiative capture and transmission of neutrons were measured on the pulsed fast reactor IBR with the injector for U-238 with the resolution time being 6 ns/m. Radiation with values Gamma sub gamma for 30 resonances and neutron widths Gamma sub neutron for 38 resonances were obtained. The average width g Gamma sub gamma = 24 MeV and the divergences of seperate radiation widths from the average one do not exceed the measurement error. Author (NSA)

N71-30695# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
INVESTIGATION OF THE PM 141 LEVELS BY THE DELAYED COINCIDENCES AND THE ANGULAR GAMMA-GAMMA CORRELATION METHOD
R. Arl't, G. Baier, Ya. Vivryskchuk, V. A. Morozov, T. M. Muminov et al 1970 12 p refs In RUSSIAN
(JINR-P6-5517) Avail: AEC Depository Libraries

The half lives were measured and the spins for the 196.5 and 628.7 keV levels in the Pm-141 nucleus were determined. Author (NSA)

N71-30696# Junta de Energia Nucleare, Madrid (Spain).
STUDY OF STRONGLY MULTIPLYING SUBCRITICAL MEDIA WITH PULSED NEUTRON SOURCE[ESTUDIO DE MEDIOS MULTIPLICATIVOS FUERTEMENTE SUBCRITICOS CON FUENTE PULSADA DE NEUTRONES]
F. J. Olarte Marin 1970 171 p refs In SPANISH
(JEN-220-DF/I-63) Avail: AEC Depository Libraries

Three experimental non-stationary techniques – the die away method, the dispersion lay method, and the modified techniques of pulsed source – are presented, developed experimentally, and used for the calculation of the nuclear parameters of two very subcritical multiplying media with theoretical reactivities of −22.8 and −61 $. The experimental system is first described. Each technique and the development of the theoretical model are described in detail. The theoretical models used are completely inadequate to explain the analysis of the curves by the dispersion law, but can be used for the other two non-stationary techniques. NSA

N71-30697# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
A SIMPLE DERIVATION OF THE KINOSHITA-LOEFFEL-MARTIN BOUND
V. V. Ezhela and Yu. G. Stroganov 1970 12 p In RUSSIAN
(IFVE-STF-70-18) Avail: AEC Depository Libraries

The simple derivation of the upper bound for the scattering amplitude at angles not equal to 0 and pi is given. The dependence of results on the analyticity region is considered. It is shown that even at the assumption of the analyticity in the whole cut plane z, the factor sin(−2) theta in the Kinoshita – Loeffel – Martin bound cannot be replaced by sin(alpha-2)theta, a > 0. Author (NSA)

N71-30698# Gosudarstvenni Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
HYPOTHESIS ON PERIPHERISM OF THE SCATTERING AND PARTICLE PRODUCTION PROCESSES AT HIGH ENERGIES CORRELATED WITH UNITARITY CONDITION IN s-CHANNEL
V. V. Anisovich and O. A. Khrustalev 1970 22 p refs In RUSSIAN
(IFVE-STF-70-7) Avail: AEC Depository Libraries

It is shown that the hypothesis on dominance of peripheral processes at high energies parallel with the unitarity condition in s-channel results in the diffractional picture of the scattering. Author (NSA)

N71-30699# Gosudarstvenni Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
THE USING OF AN IONIZATION FRICTION TO STORE HEAVY PARTICLE BEAMS
Yu. M. Ado and V. I. Balbekov 1970 19 p refs In RUSSIAN
(IFVE-SKU-70-27) Avail: AEC Depository Libraries

The possibility of storing heavy particle beams in a constant phase space is considered. The phase density is increased by friction forces caused by ionization energy losses in a substance that is introduced into the storage ring chamber. The storage is considered taking into account the Coulomb scattering, statistical fluctuations of ionization energy losses, nuclear interactions and charge exchange. The stationary beam dimensions and particle losses are found. The oscillation damping is particularly effective at the energy of a few MeV. A 1.5 MeV proton storage ring with a hydrogen target is considered. Author (NSA)

N71-30700# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
RADIATION-RESISTANT FILM TARGET
Yu. K. Akimov and G. I. Selivenov 1971 5 p refs
(JINR-E13-5621) Avail: AEC Depository Libraries

A rotating film target for nuclear particle beams is described. The peculiarity of this target is that the film is fastened in its central part to the disc and rotated in vacuum in order to increase film thermal and radiation resistance. As a result of this fact, a free peripheral part of the film is straightened in the rotation plane under the effect of centrifugal forces and this makes it possible to have a target with constantly varying radiated spot without any frames or holders along the beam path. Author (NSA)

N71-30701# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
NEUTRON YIELD IN THE MUON CAPTURE REACTION ON OXYGEN, SULFUR, CALCIUM, AND LEAD
I. Voitkovska, V. S. Evseev, T. Kozlovski, T. N. Mamedov, and V. S. Roganov 1970 14 p refs In RUSSIAN; ENGLISH summary
(JINR-P15-5524) Avail: AEC Depository Libraries

An absolute muon-capture neutron yield (per meson-capture event) was measured in oxygen, sulfur, calcium, and lead in the energy regions of 2.5 to 7.5 MeV (n = 0.526 + or − 0.0968), 1.5 to 10 MeV (n = 0.414 + or − 0.035), 2 to 10 MeV (n = 0.263 + or − 0.033), and 2 to 7 MeV (n = 0.536 + or − 0.031), respectively. In muon-capture in oxygen there is a quantitative agreement between the neutron yield value optained and the resonance model prediction on the nuclear muon-capture. Author (NSA)

N71-30708# Institute of Nuclear Research, Warsaw (Poland).
REMARKS ON THE INTENSITY MEASUREMENTS IN THE NEUTRON DIFFRACTION
Ludwik Dobrzynski 1970 35 p refs
(INR-1220) Avail: AEC Depository Libraries

The exact formulas for the intensity of Bragg-reflected neutrons are presented, and particular attention is paid to polarized neutron diffractometry. In particular, the shape and luminosity of the diffraction lines measured by different methods are considered. From the developed formulas the dependence of the polarization ratio vs the deviation angle of the sample from its Bragg position is calculated. Finally, the possible effects of crystal imperfections are briefly sketched. Author (NSA)

N71-30727# European Organization for Nuclear Research, Geneva (Switzerland).
STUDY OF NUCLEAR FISSION INDUCED BY HIGH ENERGY PROTONS
R. Brandt, F. Carbonara, E. Cieslak, H. Piekarz, J. Piekarz et al 19 Jan. 1971 26 p refs
(CERN-71-2) Avail: AEC Depository Libraries

Cross sections for binary fission of bismuth, gold, lead, uranium, and some lighter elements were determined using the mica-sandwich technique for proton energies between 0.59 and 23 GeV. Author (NSA)

N71-30729 Bonn Univ. (West Germany). Inst. fuer Strahlen und Kernphysik.
STRUCTURE INVESTIGATIONS OF NEUTRON-DEFICIENT HOLMIUM AND DYSPROSIUM NUCLEI

[STRUKTUR-UNTERSUCHUNGEN AN NEUTRONENARMEN HOLMIUM- UND DYSPROSIUM-KERNEN]
H. Schepers Dec. 1970 61 p refs In GERMAN
(BMBW-FBK-70-30) Avail: AEC Depository Libraries

By irradiation of terbium with alpha particles the radioactive isotopes Ho-156, Ho-158, and Ho-160 were produced. Singles and x−γ coincidence spectra were measured by using Ge(Li) detectors and computer methods to study the energy levels of these nuclei. The existence of several new Ho isomers is proposed. For the Dy nuclei a large number of gamma energies and nuclear levels were found. It was possible to identify some two-quasi-particle states by measuring the allowed, unhindered transitions from the odd−odd nuclei Ho-156, Ho-158, and Ho-160 to the corresponding even−even nuclei Dy-156, Dy-158, and Dy-160. The importance of the occupation probability of the neutron state negative 11/2-(505) for the sudden change of nuclear shape in the transition region near N = 89 is discussed. Author (NSA)

N71-30732# Japan Atomic Energy Research Inst., Tokyo.
THRUSH: A CODE FOR CALCULATING THERMAL NEUTRON SCATTERING KERNEL
H. Kadotani Nov. 1970 20 p refs In JAPANESE; ENGLISH summary
(JAERI-4211) Avail: AEC Depository Libraries

A code, THRUSH, for computing the thermal-neutron scattering kernel by phonon expansion method in both coherent and incoherent approximations is presented. To evaluate the scattering kernel from the double differential scattering cross section, it is necessary to perform angular integration over scattering angle. Existing codes utilize for this purpose the numerical integration of the scattering law. In order to improve the accuracy and reduce the computer machine time the integration is performed analytically in the THRUSH code. Another feature of THRUSH is that the code can calculate the coherent part of the scattering kernel as well as the incoherent part. THRUSH especially is useful for calculating the scattering kernel for heavy water. Author (NSA)

N71-30736# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
UNITARY CONDITIONS AND DECREASE OF DIFFERENTIAL CROSS-SECTION OF MULTIPLE PRODUCTION PROCESSES WITH ENERGY INCREASE
V. V. Ezhela, A. A. Logunov, and M. A. Mestvirishvili 1970 25 p refs In RUSSIAN
(IFVE-STF-70-43) Avail: AEC Depository Libraries

It is shown, that proceeding from the analytic properties of the inelastic process amplitude and unitary conditions, differential cross sections, of the multiple production processes d(Sigma)/d(Omega) for the fixed Theta unequal to 0.pi and phi unequal to 0.pi decrease with energy increase. The upper bound of decrease was found. Author (NSA)

N71-30740# Toledo Univ., Ohio.
MOLECULAR STRUCTURE STUDIES: A GAS PHASE ELECTRON DIFFRACTION UNIT EMPLOYING COUNTING TECHNIQUES Technical Progress Report, 19 Dec. 1969 − 5 Mar. 1971
H. Bradford Thompson 5 Mar. 1971 17 p refs
(Contract AT(11-1)-2058)
(COO-2058-2) Avail: NTIS

Progress in the development of a gas phase electron diffraction unit employing counting techniques is reported. The unique particle counting feature will be competitive with the conventional photographic method in terms of the quantity of sample required, and superior in versatility and precision. The design will allow use of sample quantities suitable for structural studies on new molecules. Also, the design contemplated should be adaptable to gas phase X-ray and neutron diffraction as well. Certain of the data acquisition techniques may be adaptable to studies of other scattering phenomena, and to other multiple source counting problems. Author

N71-30745*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A HIGH PASS, MECHANICAL VELOCITY FILTER FOR FAST NEUTRAL MOLECULAR BEAMS
Eugene J. Manista, John W. Sheldon, and Richard F. Tischler Washington Jul. 1971 11 p refs
(NASA-TM-X-2332; E-6333) Avail: NTIS CSCL 20H

The transmission characteristics of a mechanical velocity filter are analyzed, and a design is described in which mean velocity of transmitted beam divided by rotor speed is equal to 5990 centimeters per revolution. Preliminary results for operation of the velocity filter with a fast cesium atom beam are presented. Author

N71-30753# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
PAIR VIBRATIONS IN THE YTTERBIUM ISOTOPES
S. K. Abdulvagabova and N. I. Pyatov 1971 17 p refs In RUSSIAN
(JINR-P4-5576) Avail: AEC Depository Libraries

The properties of the neutron pair vibrations due to the pair interactions in the ytterbium isotopes are studied. The energies of 0(+)-excitations, the presented probabilities of E0- and E2-transitions and the ratio X (the Rasmussen parameter) are calculated as well as the relative probability of the pair vibration excitation in the transfer reactions of two nucleons. Author (NSA)

N71-30754# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
CORRELATIONS BETWEEN QUASIPARTICLE AND COLLECTIVE EXCITATIONS IN NUCLEI
R. V. Dzholos and V. Rybarska 1971 24 p refs
(JINR-E4-5578) Avail: AEC Depository Libraries

A coupled system of equations necessary for describing the nuclear excitations is derived on the basis of the variational principle without using equations of motion. The results are illustrated by examples. Author (NSA)

N71-30814# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
SEPARATION OF THE CENTER OF MASS MOTION IN TWO-PARTICLE SHELL MODEL WAVE FUNCTION OF THE FINITE DEPTH POTENTIAL
F. A. Gareev 1971 18 p refs In RUSSIAN (JINR-P4-5639) Avail: AEC Depository Libraries

A method of separating the center-of-mass motion in a two-particle shell model wave function of the finite-depth potential is suggested. The wave function of the center of mass is represented as a superposition of the Sturm−Liouville wave functions; therefore, the problem of taking into account the continuous spectrum influence does not arise. Author (NSA)

N71-30819# Lyon Univ. (France). Inst. de Physique Nucleaire.
USE OF THE NILSSON MODEL FOR STUDYING SOME NUCLEI OF THE 2s-1d SHELL [APPLICATION DU MODELE DE NILSSON A L'ETUDE DE CERTAINS NOYAUX DE LA COUCHE 2S-1D]
Pierre Midy (Ph.D. Thesis) Oct. 1970 94 p refs
(LYCEN-7071) Avail: AEC Depository Libraries

The unified Bohr−Mottelson model was used to interpret the first excited levels of the deformed nuclei Ne-21, Na-21, and Ne-23. A comparison was made between these results and those obtained for neighboring odd nuclei with the same number of nucleons Na-23, Mg-23, O-19(Z or N = 11), Al-25, Mg-25, Al-27,

and Si-27 (Z or N = 13). The Bohr–Mottelson model was used without the vibrational terms and with the Nilsson potential. When Z or N = 11, the predictions of the model are in good agreement with experiment except in the case of O-19, whose spectrum is not well known. The cases when Z or N = 13 were considered. Satisfactory results were obtained for Al-25 and Mg-25. It was difficult to obtain simultaneously the quadrupole moment and energy levels of Mg-25. The results for Na-23 were not so good, and an interpretation of the results for Al-27 and Si-27 was difficult. Agreement was good for particle states in the N = 2 shell but dubious for hole states in this shell. NSA

N71-30823# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
COHERENT STATE METHOD AND QUARK MODEL
P. N. Bogolyubov 1971 44 p refs In RUSSIAN
(JINR-P2-5684) Avail: AEC Depository Libraries

The connection of the coherent state method for the high energy hadron scattering with the quark models is shown. Author (NSA)

N71-30824# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
SCALAR PARTICLE SCATTERING AMPLITUDE ANALYZED ON THE BASIS OF THE BETHE-SALPETER EQUATION
S. P. Kuleshov, V. A. Matveev, M. V. Savelev, A. N. Sisakyan, and M. A. Smondyrev 1971 24 p refs
(JINR-E2-5640) Avail: AEC Depository Libraries

The Bethe–Salpeter equation for the two particle Green function is solved in the case of the generalized local kernel with the help of the operator method using the modified perturbation theory in exponent. The scalar particle scattering amplitude in the ladder approximation is found and its asymptote in the region of high energies and fixed momentum transfers is investigated. The eikonal representation of the scattering amplitude with the phase corresponding to superposition of the Yukawa quasipotentials is obtained. Author (NSA)

N71-30842*# Techtran Corp., Glen Burnie, Md.
REPORT OF RESEARCH ON ITR PROJECT OF THE INSTITUTE FOR NUCLEAR ENERGY, UNIVERSITY OF STUTTGART [BERICHT UEBER ARBEITEN ZUM ITR-PROJEKT, DES INSTITUTS FUER KERNENERGETIK DER UNIVERSITAET STUTTGART]
K. H. Hoecker et al Washington NASA Jul. 1971 50 p refs Transl. into ENGLISH of Stuttgart Univ. report K-17
(Contract NASw-2037)
(NASA-TT-F-13704; K-17) Avail: NTIS CSCL 20H

Theoretical and experimental incore thermionic reactor research is reported. Computerized calculations of neutron cross sections were performed. Shielding problems with two dimensional flow and weight optimization for the ITR flight version are discussed. A theoretical model for the calculation of short-time behavior of the unregulated installation, and loss in the thermal processing of ITR are described. Thermal conductivity, degree of total emission, starting behavior of heat ducts, and temperature distribution in the thermionic cell were determined. N.E.N.

N71-30860# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
CRITICALITY DATA FOR URANIUM ISOTOPES U 238; URANYL NITRATE, URANYL NITRATE/UF6 MIXTURES AND URANIUM DIOXIDE/TRICHLORO ETHYLENE: A BIBLIOGRAPHY
Jean Geue, comp. Jan. 1971 56 p
(AAEC/Lib/Bib-265) Avail: AEC Depository Libraries

Four hundred and thirteen references are listed covering the period 1941 to 1970. Arrangement is chronological by year and alphabetical by author within each year. Reference is made to an abstract for each article. NSA

N71-30863# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorentwicklung.
REPORT ON THE PROBLEMS OF NEUTRON PULSE EXPERIMENTS ON COMPACT GRAPHITE AS WELL AS ON THE QUESTION OF HETEROGENEITY INFLUENCES OF CAVITIES ON THE DIFFUSION BEHAVIOR OF THERMAL NEUTRONS IN SYSTEMS WHICH CONTAIN SPHERICAL GRAPHITE ELEMENTS [EIN BEITRAG ZUR PROBLEMATIK VON NEUTRONENPLUS-EXPERIMENTEN AN KOMPAKTGRAFIT SOWIE ZUR FRAGE DER HETEROGENITAETSEINFLUESSE HOHLRAEUMEN AUF DAS DIFFUSIONSVERHALTEN THERMISCHER NEUTRONEN IN SYSTEMEN, DIE KUGELFOERMIGE GRAFITELEMENTE ENTHALTEN]
Manfred Huels Aug. 1970 220 p refs In GERMAN
(JUL-690-RG) Avail: AEC Depository Libraries

In addition to the various experimental methods for the determination of the diffusion parameter of thermal neutrons, a survey of the theoretical attempts to represent the interaction of neutrons with moderator nuclei is presented. The description and interpretation of neutron pulse experiments on compact graphite piles or on systems containing graphite spheres are given. The question of the heterogeneity influence on the neutron diffusion in graphite sphere packings is considered. Author (NSA)

N71-30878# Nuklear-Chemie und -Metallurgie, G.m.b.H., Wolfgang bei Hanau (West Germany).
DEVELOPMENT OF A LARGE AREA BLIND TARGET AND A TARGET MANIPULATOR [HERSTELLUNG EINES GROSSFLAECHENBLINDTARGETS UND EINES TARGETMONTAGEMANIPULATORS]
H. Fabian Bonn Bundeswehramt 1971 24 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Verteidigung
(BMVg-FBWT-71-1) Avail: NTIS; Bundeswehramt, Bonn: 25 DM

The development of a large-area particle accelerator target for neutron fluxes up to 5.10 to the 13th power neutrons/sec is described. After preliminary tests, a round target with 800 mm diameter, and divided into 44 sections is assembled. The capacity for cooling is designed for 150 kW thermal energy. A remotely-controlled manipulator is used for handling the neutron activated target. ESRO

N71-30890# Bhabha Atomic Research Centre, Bombay (India).
NUCLEAR DATA ACTIVITIES IN INDIA, 6 Progress Report
M. Balakrishnan, comp. 1970 63 p refs
(BARC-474) Avail: AEC Depository Libraries

Progress in nuclear data activities in India during 1969 is reported. NSA

N71-30897# Commissariat a l'Energie Atomique, Limeil (France). Centre d'Etudes.
THE STUDY OF THE REACTIONS C 12 + t AT ENERGIES BETWEEN 0.5 AND 1.2 MeV
Jacqueline Pornet, Jean-Pierre Ulpat, and Francoise Bertrand Feb. 1971 25 p refs In FRENCH
(CEA-R-4133) Avail: AEC Depository Libraries

Angular distributions and absolute cross sections for the C-12(t,p)C-14 (ground state) reaction and the C-12(t,alpha)B-11 (ground state and first excited state) reactions were measured for triton energies between 0.5 and 1.0 MeV. Excitation curves show pronounced resonances corresponding to the 15.40- and 15.75-MeV excited levels of the N-15 compound nucleus. NSA

N71-30900# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

ON ISOMERIC 8(−) YIELDS 8(+) TRANSITION IN THE Ba 130 NUCLEUS

D. A. Arsen'ev and R. V. Dzholos 1971 15 p refs Submitted for publication

(JINR-E4-5607) Avail: AEC Depository Libraries

A model describing some properties of the transition nuclei is given. In verifying the validity of this model the results of the calculations of the ground- and excited-state energies of these nuclei are employed. The origin of the isomeric 8(−) state in the Ba-130 nucleus is clarified. Author (NSA)

N71-30901# Bhabha Atomic Research Centre, Bombay (India). Nuclear Physics Div.

FORMALISM FOR THE STUDY OF TWO HOLE STATES IN NUCLEI WITH THE (PION(−), NUCLEON NUCLEON) REACTION

B. K. Jain 1970 33 p refs

(BARC-512) Avail: AEC Depository Libraries

A formalism is developed to study two-hole states in atomic nuclei with the (pion(−),NN) reaction. The interaction of the pion with the nucleus is described by a two-nucleon model. The interaction of outgoing nucleons with the residual nucleus is incorporated through the optical-model potential. The spectroscopic amplitude for the two nucleons in the nucleus is given in the LS-coupled basis states of the shell model. Author (NSA)

N71-30902# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

RELATIONSHIP BETWEEN RADIOACTIVE IRON AND CHROMIUM DIFFUSION IN Fe-Cr ALLOYS CONTAINING 0-15 PERCENT Cr AND THE REVERSIBLE ALPHA YIELDS (ALPHA + GAMMA) YIELDS GAMMA TRANSFORMATIONS. EFFECT OF CARBON IMPURITIES

Anne-Marie Huntz (Ph.D. Thesis) Nov. 1970 159 p refs In FRENCH

(CEA-R-4023) Avail: AEC Depository Libraries

To relate the diffusion phenomena to the phase transformation, the volume and grain boundary diffusion coefficient measurements of Fe-59 and Cr-51 were carried out in Fe-Cr alloys, with Cr compositions in the gamma loop, in the alpha or gamma single phase, or the duplex (alpha + gamma) phase, using the generalized Gruzin method and the Suzuoka analysis. Metallographic studies of the alloys microstructure and autoradiographic techniques enabled preferential diffusion phenomena to be examined in interfaces and to specify the phase transformation mechanisms. By static methods, the curves defining the gamma loop were accurately determined. Carbon, in trace quantities, when segregated to the grain boundaries decreased the rate of boundary diffusion, widened the gamma loop, and had a large influence on the microstructure of gamma crystals during their growth, and on the gamma yields alpha transformation during cooling. The autoradiographic technique showed that the gamma crystals transform to a martensite nucleus surrounded by a ferrite border. This phenomenon is related to a carbon concentration gradient. Author (NSA)

N71-30903*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.

SHAPE RESONANCES AND ROTATIONALLY PREDISSOCIATING LEVELS: THE ATOMIC COLLISION TIME-DELAY FUNCTIONS AND QUASIBOUND LEVEL PROPERTIES OF H2 (X(1 SIGMA g +))

Robert J. LeRoy and Richard B. Bernstein 11 Jan. 1971 52 p refs

(Grants NGL-50-002-001; NSF GB-16665)

(NASA-CR-119245; WIS-TCI-427) Avail: NTIS CSCL 20H

Peaks in this function determine the scattering resonance energies E sub r and widths Gamma, and the lifetimes for each of the corresponding quasibound vibrational rotational levels. Small differences are found betwen these E sub r and Gamma, and the values obtained by a maximum internal amplitude approach. Approximate procedures for rapid, accurate numerical evaluation of E sub r are appraised; a new, outer boundary condition criterion for resonances leads to the best agreement with the exact results. Also, a primitive WKB procedure yields Gammas of usable accuracy. For ground state H2, HD, and D2, the onset of line broadening due to centrifugal barrier penetration is found to occur at energies some hundreds of 1/cm below the locus of barrier maxima. The predissociation method of estimating long range interatomic forces therefore cannot be expected to yield valid results for hydridic diatomics. Author

N71-30913# Technische Univ., Berlin (West Germany). Fakultaet fuer Allgemeine Ingenieurwissenschaften.

CONSIDERATION OF LATTICE PERIODICITY IN ELECTRON PLASMON SCATTERING [BERUECKSICHTIGUNG DER GITTERPERIODIZITAET BEI DER ELEKTRON-PLASMON-STREUUNG]

Walter Muenchmeyer (Ph.D. Thesis) 1969 98 p refs In GERMAN

Avail: NTIS

Electron scattering is considered for solid bodies that are electronically excited by penetrating electrons. Reflected electron directions are determined by Bragg conditions. A quantum mechanical four-particle formalism proves that direct inelastic scattering during reflection is triggered by plasma oscillations and thus contributes to anormalous absorption. Fermi surfaces that deviate from spherical shapes determine the reflexes that contribute to direct inelastic scattering. This is shown to be the case in magnesium, beryllium, and copper. Transl. by G.G.

N71-30917*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

LONG-RANGE ELECTROSTATIC AND ELECTROMAGNETIC INTERACTIONS BETWEEN ATOMS

Jose Luis M. Cortez Washington Jun. 1971 195 p refs

(NASA-TR-R-367; M432) Avail: NTIS CSCL 20H

The contribution to the interaction energy between two neutral hydrogenic atoms in their ground state because of their electrostatic interaction and the presence of an electromagnetic radiation field in the system is examined. The inclusion of the radiation field in the Hamiltonian of the system gives rise to retardation effects in the interaction energy which are a function of the separation R between the atoms. These effects are unimportant for distances smaller than the wavelength lambda, associated with the radiation being considered, and increase in importance as R approaches lambda. In the case of atomic systems, the smallest wavelength associated with atomic transitions is large when compared to the atomic dimensions; hence, the problem can be treated using nonrelativistic quantum electrodynamics. This allows us to neglect the particle spin and to use simple product eigenfunctions for the atomic and photon states. In addition, the above simplifications make it possible to treat the problem using standard nondegenerate perturbation theory. This feature is crucial since the calculation must be pushed to fourth order before obtaining nonzero corrections to the interaction energy due to the radiation field. Author

N71-30936# Royal Inst. of Tech., Stockholm (Sweden). Div. of Theoretical Physics.

THEORETICAL STUDIES OF PARTICLE MOTION AND COLLECTIVE VIBRATIONS IN ATOMIC NUCLEI. APPLICATIONS OF THE NUCLEAR SHELL MODEL IN THE LEAD REGION. PION EXCHANGE CORRECTIONS TO SINGLE PARTICLE OPERATORS

Jan Blomqvist (Ph.D. Thesis) 1971 24 p refs

Avail: NTIS

Summaries are presented of the papers comprising the thesis. These include shell model calculation in the lead region with a diffuse nuclear potential, magnetic moments of single-particle states in Pb-207 and Bi-209, collective monopole vibrations in closed-shell nuclei, collective O(−) vibrations in even spherical nuclei with tensor forces, particle-hole excitations with a sum of separable interactions, core polarization and particle-hole excitations in Ca-40 and Ca-48, dipole states in Pb-208, two phonon quartet and proton pairing vibration in Pb-208, high-spin three-particle states in Bi-207, isomeric 29/2(+) level in At-211, high-spin core-excited states in Po-210, high-spin states of two-neutron-hole configuration in Pb-206, retarded transition in Ta-181 and Lu-175, and PCAC and triton beta decay. N.E.N.

N71-30951# Technische Univ., Berlin (West Germany).
EXPERIMENTAL STUDY OF THE 5d6s6p z 2F TERMS IN LANTHANUM I SPECTRUM USING LEVELCROSSING METHOD AND DOPPLER RESONANCE SPECTROSCOPY. NUCLEAR QUADRUPOLE EXCHANGE EFFECT FOR CONFIGURATIONS OF THE TYPE s p d AND THEORETICAL INTERPRETATION OF OBSERVED HYPERFINE STRUCTURE EXCHANGE EFFECT [EXPERIMENTELLE UNTERSUCHUNG DER 5D6S6P Z 2F TERME IN LANTAAN 1 SPEKTRUM UNTER VERWENDUNG VON LEVELCROSSING TECHNIK UND DOPPELRESONANZSPEKTHOSKOPIE. KERNQUADRUPOLWECHSELWIRKUNG FUER KONFIGURATIONEN VOM TYP S P D UND THEORETISCHE INTERPRETATION DER BEOBACHTETEN HYPERFEINSTRUKTURWECHSELWIRKUNG]
Achim Hese (Ph.D. Thesis) 1969 132 p refs In GERMAN
Avail: NTIS

The known nuclear moments for the 5d6s6p configuration are used to determine A- and B-factors in the z 2f states by using intermediate coupling effects. Computerized diagonalization of the energy matrices is used to approximate level energies and the g sub J-factor eigenfunctions in the intermediate coupling. The matrix elements for the quadrupole exchange effects in LS- and jj-coupling are reduced to one-electron matrix elements with relativistic corrections. Reliable one-electron factors are obtained from spectroscopic data. This method makes it possible to describe most hfs constants through intermediate couplings and to position the 5d6s6p lanthanum configuration halfway between the LS- and jj-coupling. Transl. by G.G.

N71-31039 Ohio State Univ., Columbus.
HIGHLY EXCITED STATES OF C 12 AND O 16 FROM He 2 CAPTURE STUDIES
Kuk Jin Moon (Ph.D. Thesis) 1969 98 p
Avail: Univ. Microfilms Order No. 14077

The differential cross sections from the Be-9(He-3,gamma)C-12 reaction were measured with 3 to 6 MeV He-3. Two resonances were observed: one which decays via gamma rays to the ground and second excited states of C-12 with 3.5 MeV He-3 and the other which decays to the first excited state of C-12 with 5.5 MeV He-3. These He-3 energies correspond to 28.9 and 30.4 MeV of excitation energy of C-12. Angular distribution measurements were also made at these resonances and analysis of the angular distribution measurements led to the assignments of 1(−) or 2(+) to the 28.9 MeV state of C-12 and 3(−) to the 30.4 MeV state of C-12 as the spins and parities of the resonances respectively. Differential cross section measurements form the C-13(He-3,alpha gamma gamma)C-12 reaction were also made and two prominent broad peaks were observed in the 15.11 MeV gamma ray excitation curve from 5.5 and 9.5 MeV He-3 energies. The result of the 12.71 MeV gamma ray yield curve reveals a peak around 6.0 MeV He-3 energy. The radiative capture reaction C-13(He-3,gamma)O-16 was also studied. Dissert. Abstr.

N71-31047 Wisconsin Univ., Madison.
ROTATING FRAME DOUBLE RESONANCE AND NUCLEAR CROSS RELAXATION IN LITHIUM FLUORIDE
David Vern Lang (Ph.D. Thesis) 1969 88 p
Avail: Univ. Microfilms Order No. 70-3599

The Li-6/Li-7 system in LiF was considered and cross-relaxation dynamics from the Li-7 free induction decay data were obtained via a general expression which was derived. The presence of F-19 spins, which constitute a third species interacting strongly with the Li systems in LiF, were taken into account. The resulting rotating frame nuclear double resonance behavior did not differ qualitatively from that in a simple two species system. The cross-relaxation time dependence was well described by an exponential or sum of exponentials for times longer than the order of T sub 2, with nonexponential behavior for shorter times. The cross-relaxation rate exhibited a Lorentzian dependence on the magnitude of the Li-6 rf field, H sub 1e, for the case where the Li-7 system was adiabatically demagnetized in the rotating frame; the results show that the Gaussian behavior previously assumed is incorrect. Dissert. Abstr.

N71-31048 Washington Univ., Seattle.
VARIATIONAL CALCULATION OF ELECTRONIC OR NUCLEONIC ORDERED SYSTEMS
Robert Lynn Caldwell (Ph.D. Thesis) 1969 126 p
Avail: Univ. Microfilms Order No. 70-14746

A variational calculation was made of the ground state energy of an electronic or nucleonic many-body system using Mathieu functions of fractional order as orthogonal single particle wave functions. This produced a system trial wave function capable of approximating either a system of uniform density or a crystal like system, depending on the value of a variational parameter, q, present in the Mathieu functions. A new lowest upper bound to the energy of an electron system was found for r sub s greater than 12 and to the energy of a nucleon system for r sub o between .2 fm and 1.0 fm. The correlation function for berious values of q and hence for the wave functions giving the minimum energy for various values of r sub s and r sub o is presented largely to decide if the crystallization implied is real in the sense that the system could reasonably be expected to be crystalline or apparent in the sense that the true wave function would be of this type. Dissert. Abstr.

N71-31049 California Univ., Berkeley.
THE EXTENDED CRANKING MODEL AND THE MOMENT OF INERTIA OF THE HIGH SPIN ROTATIONAL STATES OF DEFORMED NUCLEI
Chin-Wah Ma (Ph.D. Thesis) 1969 137 p
Avail: Univ. Microfilms Order No. 70-13105

A matrix diagonalization method based on the cranking model is used to calculate theoretically the effective moment of inertia up to high-spin rotational states for rare earth nuclei. Approximations are introduced, including the truncation of the number of quasi-particles and the use of a simplified Nilsson scheme in which the single particle angular momentum is kept as a good quantum number in the basis. The results indicate the following: (1) The large high-order admixtures in cranking solutions make the usual lowest order cranking formula unreliable for spin I > or = 6-8. (2) The Coriolis-anti-pairing effect makes the major contribution to the increase of moment of inertia with spin. However, the C-A-P effect is generally overestimated by the BCS method, and the fixed-particle-number correction considerably reduces the C-A-P effect. The collective gyromagnetic ratio and the rotational-vibrational coefficient associated with (I sq)(I + 1)sq term have also been calculated. Dissert. Abstr.

N71-31080 Illinois Univ., Urbana.
COMBINED X-RAY AND THERMAL CONDUCTIVITY STUDY

OF HEXAGONAL-CLOSE-PACKED HELIUM-4
Samuel Clark Fain, Jr. (Ph.D. Thesis) 1969 99 p
Avail: Univ. Microfilms Order No. 70-13302

Thermal conductivity measurements made on hexagonal-close packed helium-4 are reported for specimens whose quality and orientation were determined directly by an X-ray method. The specimens, 2.2 mm in diameter by 23 mm long, were held in a nylon container. They were obtained by unidirectional growth from the fluid at a constant pressure of 290 atmospheres and by recrystallization. Laue X-ray photographs taken over 17 mm of the total length proved to be a very sensitive indicator of specimen quality. These photographs showed specimens grown from the fluid in the nylon container to be of inferior quality to those obtained by recrystallization of samples rapidly grown from the fluid. The thermal conductivity was lower in the low temperature and the umklapp regimes for the specimens of inferior quality. The thermal conductivity was highest at all temperatures for a single crystal obtained by recrystallization. Dissert. Abstr.

N71-31051 Illinois Univ., Urbana.
USE OF SIMPLE HARMONIC FORCES IN THE NONRELATIVISTIC QUARK MODEL
David Faiman (Ph.D. Thesis) 1969 102 p
Avail: Univ. Microfilms Order No. 70-13301

Attention is drawn to a possible band structure displayed by the known N* resonances. The observed spectrum is similar to that predicted by a paraquark harmonic oscillator shell model. Exact three body Schroedinger wave functions are used to compute the N pion partial decay widths, assuming the pion emission takes place via a one quark deexcitation. The agreement with experiment is sufficiently good to warrant an investigation of the N pion decay widths of all resonances predicted to have masses up to about 2 GeV. The model is then used to estimate the radiative widths of the observed N* resonances. The model is extended to include the strangeness-zero meson resonances, and the root mean square pion radius is found to be larger than that of the nucleon. The principal failures of the model are its inability to predict the correct shape for the nucleon electromagnetic form factors, and both the proton magnetic moment and the pion-nucleon coupling constant are predicted to be 40% larger than the experimental findings. Dissert. Abstr.

N71-31062 Washington Univ., Seattle.
SINGLE NUCLEON TRANSFER REACTIONS: THE EXTRACTION OF RELIABLE SPECTROSCOPIC FACTORS AND CHARGE EXCHANGE EFFECTS
Roger Albert Hinrichs (Ph.D. Thesis) 1969 219 p
Avail: Univ. Microfilms Order No. 70-14763

The single nucleon transfer reactions (d,p) and (p,d) on Zr and Mo isotopes have been studied with an interest in spectroscopic and reaction mechanism information. The effects of charge exchange upon the excitation functions for such transfer reactions has been observed not only in the outgoing proton channel but also in the incident proton channel. Tentative evidence for such isospin coupling has been obtained for proton induced reactions on Mo-92, Mo-95, Mo-100 and Zr-94. The shapes of the anomalies are similar in most all cases. For Mo-98(p,d), anomalous behavior in the excitation function was observed not only at the threshold for the (p,n) reaction to the isobaric analog state but possibly also at the quasi-inelastic threshold to collective states. Dissert. Abstr.

N71-31063 Ohio State Univ., Columbus.
A STUDY OF THE EXCITED STATES BETWEEN 18 AND 22 MeV IN B 10
Samuel Chen-Ying Ling (Ph.D. Thesis) 1969 93 p
Avail: Univ. Microfilms Order No. 70-14065

A broad resonance which decays to the third and fourth excited states in B-10 was found at the bombarding energy of 3.4 MeV with an experimental width of 0.91 MeV. Analysis of the angular distribution measurements together with results from Li-7(He-3,alpha)B-9 reaction led to the assignment of 1(−) as the spin and parity of the resonance. Similar analysis applied to data of strong resonances previously reported at 1.1 and 2.2 MeV yielded the following results: 2.1 MeV in resonance energy with width 0.23 MeV and spin and parity assignment 1(−); 1.0 in resonance energy with width 0.26 MeV and probable spin and parity assignment 1(−) or 2(−) the first value somewhat favored. In addition, lower limits of the radiative widths of these resonances were also established. Dissert. Abstr.

N71-31083*# California Univ., La Jolla. Dept. of Radiology.
CHANGES IN THE FREQUENCY DISTRIBUTION OF ENERGY DEPOSITED IN SHORT PATHLENGTHS AS A FUNCTION OF ENERGY DEGRADATION OF THE PRIMARY BEAM
Norman A. Baily, John E. Steigerwalt, and Jerald W. Hilbert [1971] 15 p refs
(Grant NGL-05-009-103)
(NASA-CR-111943) Avail: NTIS CSCL 20H

The frequency distributions of event size in the deposition of energy over small pathlengths were measured after penetration of 44.3 MeV protons through various thicknesses of tissue-equivalent material. These distributions were measured over a range of penetration extending from zero thickness to thicknesses of muscle-equivalent plastic close to that corresponding to the total range of the protons. These distributions are those associated with the passage of the proton through 0.567 × 0.0001 sq cm of a tissue-equivalent gas. The transition from the region where statistical fluctuations dominate to that where a significant spread in beam energy has taken place is clearly demonstrated. In no instance does it appear that the concept of dose based upon a value of the stopping power or average energy deposited adequately defines the energy delivered to a structure having the dimensions usually associated with those of biological significance if only a relatively small number of events are required for induction of damage. Author

N71-31097# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
TEST OF MODELS FOR THE ASYMPTOTIC BEHAVIOR OF THE PION(+ OR −) PROTON SCATTERING AMPLITUDES
O. V. Dumbrais 1971 6 p refs In RUSSIAN
Avail: AEC Depository Libraries

Many different models have recently been proposed to explain the Serpukhov data on the pion(+ or −) proton total cross section above 20 GeV, so that considerable ambiguity remains in the theoretical description of pion(+ or −) proton scattering at high energies. It is shown that a simple finite-energy sum rule provides a strong consistency test of models for the asymptotic behavior of the amplitudes. In particular, the hypothesis that the pion(+ or −) proton total cross sections have already reached their limits at 30 GeV can be confirmed by the sum rules. Author (NSA)

N71-31120*# Jet Propulsion Labs., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
ANALYTICALLY DETERMINED RESPONSE OF A 300-MICRON SILICON DETECTOR TO A POLYENERGETIC BEAM OF NEUTRONS
M. Taherzadeh *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 119–130 refs (See N71-31108 18-30)
Copyright. Avail: NTIS CSCL 20H

The response of a 300 microns silicon detector to an incident polyenergetic neutron beam emitted from a plutonium dioxide fuel power source is determined. The results indicate that the response of the detector is basically due to elastic scattering reactions, and the contribution from other reactions is very small. For neutron energies greater than 4.5 MeV, the reactions contribute less than

2% to the total response. The maximum response for this detector is less than .004 counts/neutron within the range of bias energies of 25 to 250 keV. Author

N71-31126 Michigan Univ., Ann Arbor.
THE NUCLEAR STRUCTURE OF Ce 140, Pr 141, AND Nd 142 DETERMINED BY THE (d,He 3) AND (He 3,d) REACTIONS
William Philip Jones (Ph.D. Thesis) 1969 96 p
Avail: Univ. Microfilms Order No. 70-14558

The nuclear structure of the isotones Ce-140, Pr-141, and Nd-142 were studied with the reactions Pr-141(d,He-2)Ce-140, Ce-140(He-3,d)Pr-141, and Pr-141(He-3,d)Nd-142. Excitation energies and absolute cross sections were measured for states with excitation energy below 4.0 MeV in Ce-40, 2.0 MeV in Pr-141, and 4.5 MeV in Nd-142. Angular distributions were measured for these states and the techniques of distorted wave analysis used to extract spectroscopic information. Shell model calculations were performed in a generalized seniority basis using either a surface delta interaction or a generalized pairing Hamiltonian. The agreement between the experimentally derived information and results of the calculations for Ce-140 and Nd-142 was quite good. The calculation for Pr-141 was somewhat less satisfactory than hoped for. Dissert. Abstr.

N71-31133 North Carolina Univ., Chapel Hill.
ANGULAR DISTRIBUTION OF FAST ELECTRONS EMITTED FROM THE INNER ATOMIC SHELLS BY PROTON IMPACT
Byung-Ho Choi (Ph.D. Thesis) 1969 38 p
Avail: Univ. Microfilms Order No. 70-3214

Time-dependent perturbation theory was used to evaluate the angular distribution of electrons (delta rays) emitted from heavy atoms in collisions of protons and other heavy charged particles. The incident particle was assumed to move on a classical straight line trajectory. Hydrogenic wave functions were used for the initial electron state and continuum Coulomb wave functions for the final electrons. Comparison was made between the angular distributions of electrons emitted from K- and L-shells at the same incident energy. At not too small angles and a sufficiently high kinetic energies of the electrons, the K-electrons contribute predominantly. The separate contributions of the L-subshells to the angular distributions were also calculated. Dissert. Abstr.

N71-31136# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
REGGE CUTS AND HIGH ENERGY PION NUCLEON AND KAON NUCLEON SCATTERING
R. Hong Tuan, J. M. Kaplan, and G. Sanguinetti (Pisa Univ., Italy) Mar. 1971 51 p refs
(LPTHE-71/14) Avail: NTIS

A phenomenological analysis of pion nucleon and kaon nucleon elastic and charge exchange scattering is made in the framework of convolutions models. The Pomeron trajectory is taken with a nonzero slope which allows one to describe high-energy total cross sections (without violating the Pomeranchuk conjecture) together with d(sigma)/dt and P sub O. For the Regge contribution strong exchange degeneracy and Gell-Mann's ghost killing mechanism are used. A rather good fit to the data for absolute t < 1.5 GeV squared is obtained. The slope of the Pomeron is found to be the same as for proton proton scattering. In pion proton scattering no cut should be present in the helicity flip amplitude. Author

N71-31160# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
SOME CONSEQUENCES OF THE CONSTANT BEHAVIOR OF THE TOTAL CROSS-SECTION ABOVE 30 GeV
I. G. Aznauryan and L. D. Solovev 1970 25 p refs In RUSSIAN
(IFVE-STF-70-3) Avail: AEC Depository Libraries

The Serpukhov data on total cross sections up to 65 GeV suggest that the differences of the total cross sections delta(negative pion)-delta(positive pion) and delta(negative kaon)-delta (positive kaon) may be independent of energy above 25 to 30 GeV. Some consequences of this suggestion are considered. In particular, the differential cross section for pion-nucleon charge exchange scattering and the kaon regeneration amplitude on hydrogen following are obtained. Author (NSA)

N71-31194*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROTATIONAL AND VIBRATIONAL EFFECTS IN ION-DIPOLE COLLISIONS
John V. Dugan, Jr., Raymond W. Palmer, and R. Bruce Canright, Jr. 1971 12 p Presented at 7th Intern. Conf. on The Phys. of Electron. and Atomic Collisions, Amsterdam, 25-30 Jul. 1971; Sponsored by IUPAP and Netherlands Phys. Soc.
(NASA-TM-X-67878; E-6445) Avail: NTIS CSCL 20H

The behavior of ion-dipole collisions is constrasted with ion-induced-dipole (Langevin) collisions in a motion picture. A sound track for the 17-minute (16-mm) color motion picture, supplemented by eight figures, is presented. The film consists of five separate computer-made collision sequencies, five animated sequences, and eight stills, some of which are computer-made time history plots. Author

N71-31200 Washington Univ., Seattle.
THE HEAT CAPACITY OF SUB-MONOLAYER He 2 AND He 4
Glenn Alexander Stewart (Ph.D. Thesis) 1969 140 p
Avail: Univ. Microfilms Order No. 70-14790

The heat capacities of sub-monolayer He-2 and He-4 adsorbed on argon pre-plated copper sponge have been measured for temperatures between 0.5 and 4.3 K. Temperature dependences for surface coverages of 0.1, 0.3, 0.5 and 0.7 monolayer resemble those of two dimensional Debye solids. The He-4 coverage dependence is consistent with surface phase equilibrium on an inhomogeneous substrate composed of single and double argon layers. He-3 heat capacities for T > 3.5 K and coverages of 0.7 and 0.9 monolayer exhibit exponential excess signals which are associated with desorption. Isosteric heats of adsorption for these He-3 coverages have been estimated from the heat capacity data. Dissert. Abstr.

N71-31218# Washington Univ., Seattle. Dept. of Physics.
EFFECTS OF LATERAL SUBSTRATE FIELDS ON HELIUM MONOLAYERS
C. E. Campbell, J. G. Dash, and M. Schick [1971] 10 p refs Sponsored in part by AEC and NSF
(RLO-1388-604) Avail: NTIS

Heat capacities of He monolayers on graphite show qualitative differences between He 3 and He 4 contrary to the usual theories of 2D quantum fluids. The differences are attributed to weak lateral fields due to substrate inhomogeneities and, using a 2D ideal gas model, qualitative agreement is found between theoretical and observed heat capacities. Author (NSA)

N71-31219# Washington Univ., Seattle. Dept. of Physics.
SUBSTRATE MEDIATED INTERACTION BETWEEN ADSORBED ATOMS
M. Schick and C. E. Campbell [1971] 27 p refs Sponsored in part by AEC and NSF
(RLO-1388-605) Avail: NTIS

An effective interaction between atoms adsorbed on a substrate is calculated. The interaction arises from the exchange of phonons in the substrate and makes a density-dependent contribution to the ground-state energy per particle of the adsorbed system. Results

are applied to submonolayer helium film adsorbed on argon-plated copper studied by Stewart and Dash. It is shown that, for this system, the interaction is attractive and contributes to the ground-state energy per particle an amount of the order of -1 K, a significant fraction of the observed binding energy. The role of the effective interaction in bringing about the enhancement of the binding energy and the formation of dense clusters observed by Stewart and Dash is discussed. Author (NSA)

N71-31234# Catholic Univ. of America, Washington, D.C. Dept. of Nuclear Science and Engineering.
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF NUCLEAR FISSION INDUCED BY LOW ENERGY NUCLEAR PARTICLES Progress Report
S. L. Bacharach and R. W. Deutsch 29 Jan. 1971 35 p refs
(Contract AT(40-1)-3951)
(TID-25659) Avail: NTIS

Measurements were made of the delayed fission of Pu-237 produced by 9.0 to 14.0 MeV deuterons bombardment of Np-237. Two isomers with half lives of 112 + or - 10 and 1090 + or - 310 nanoseconds were identified. This is the first time that these two isomers have been measured simultaneously. The relative yields of these isomers show that the 112 ns isomer increases relative to the 1090 ns isomer as the deuteron energy decreases, which indicates a possible inconsistency in the Strutinsky double humped potential. A method for predicting the prompt neutron yields from thermal neutron fission was developed, based upon available measured characteristics of U-233, U-235, and Pu-239 thermal neutron fission. This method can be applied to determine prompt neutron yields from unmeasured thermal neutron fissionable elements that are present in long burning nuclear reactors. Author (NSA)

N71-31239 Wisconsin Univ., Madison.
THE PAIR DISTRIBUTION FUNCTION IN CLASSICAL STATISTICAL MECHANICS
Melvin Jared Stavn (Ph.D. Thesis) 1969 119 p
Avail: Univ. Microfilms Order No. 70-3714

Using the Percus-Yevick and convoluted hypernetted chain approximations to the compressibility and virial coefficients, bounds on the exact fourth virial coefficient are established for a repulsive potential. The question of the existence of similar bounds on higher virial coefficients is resolved by direct counter-examples in various model potentials. The differential expression of Nijboer and Van Hove for the incomplete diagrammatic approximation Chi(r) to the Wheatstone bridge elementary cluster diagram in the BGY superposition approximation is integrated using a technique due to Born and Green. The virial theorem is used to construct an extended virial equation for a fluid system in an external field. Two functional derivatives of the extended virial equation are taken with respect to the externally applied potential. The second functional relationship is cast into the form of a functional equation for the pair distribution function. Dissert. Abstr.

N71-31258 Arkansas Univ., Fayetteville.
THEORETICAL INTEGRAL REACTION PROBABILITIES FOR MOVING TARGET MODERATION
A. J. Anglin (Ph.D. Thesis) 1970 157 p
Avail: Univ. Microfilms Order No. 70-17175

Probability distribution functions are calculated for the nonreactive collisions (moderation) of T atoms with H2, D2, HD, or Ar and for D atoms with H2 or DI by a Monte Carlo method. The motion of the target molecule or atom is taken into account, and the calculations are for initial projectile atom laboratory energies between 0.0 eV and 200.0 eV. Integral reaction probabilities, A(E), for the T + H2,D2,Ar; T + HD,Ar; and D + H2,DI systems are calculated for a variety of compositions. Use is made of the integral reaction probability formalism, hard-sphere quantum mechanical nonreactive cross sections, quasiclassical reaction cross sections, and the probability distribution functions for moving target collisions. The corresponding A(E) values for static target moderation are also calculated and compared to the corresponding moving target results. Dissert. Abstr.

N71-31259 Florida Univ., Gainesville.
THE EMISSION OF LONG-RANGE ALPHA PARTICLES IN THE FISSION PROCESS
Glen Roberts Bethune (Ph.D. Thesis) 1969 157 p
Avail: Univ. Microfilms Order No. 70-14855

The properties of long-range alpha particles emitted in the thermal neutron induced fission of U-235 were examined in a three-parameter correlation experiment. Three semiconductor detectors in conjunction with triple coincident electronic equipment and a multiparameter analyzer made it possible to simultaneously detect the two fission fragments and the alpha particle from a ternary event and to analyze the energy of the three particles. Data were collected for eight values of the angle between the alpha particle and the direction of the light fission fragment over a range of 40 to 145 degrees. These data allowed a solution of the momentum conservation equations for the two fission fragment masses which gave a quadratic equation and, therefore, two possible masses for each fission fragment. The general characteristics of the alpha particles are presented in form of the measured angular and energy distribution. Dissert. Abstr.

N71-31261 Arkansas Univ., Fayetteville.
NEW ISOTOPE ERBIUM 173
Haruhiko Ihochi (Ph.D. Thesis) 1970 78 p
Avail: Univ. Microfilms Order No. 70-17182

Irradiations of natural ytterbium and enriched Yb-176 samples were found to produce a new radioactive nuclide which was assigned to Er-173. The following radiation characteristics were observed to belong to the decay of Er-173 and their values were determined: half-life (12.0 + or - 0.3 minutes); beta ray energies and their relative intensities; and gamma ray energies and their relative intensities. A decay scheme is proposed for the decay of Er-173 and the K = 1/2 anomalous rotational bands of Tm-173 are investigated in terms of the unified model. Dissert. Abstr.

N71-31273# DuPont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
Cf 252 SHIELDING GUIDE
D. H. Stoddard and H. E. Hootman Mar. 1971 82 p refs
(Contract AT(07-2)-1)
(DP-1246) Avail: NTIS

Neutron and gamma ray dose rates were calculated for Cf-252 source interaction with most common shielding materials. Information was compiled to assist Cf-252 evaluators and prospective users in determing: radiations involved with the use of C-252; personnel dose guides and shipping dose rate levels for C-252; comparative thicknesses of different shield materials required for a specific Cf-252 dose reduction; and approximate flux levels for neutron activation and background radiation levels in applications. Author (NSA)

N71-31282# Battelee-Northwest, Richland, Wash. Metallurgy Development Dept.
X-RAY COMPARISON OF BETA PLUTONIUM GRAIN SIZE
R. P. Allen, H. W. Arrowsmith, and R. D. Nelson Jan. 1971 14 p refs
(Contract AT(45-1)-1830)
(BNWL-1545) Avail: NTIS

The relative grain size of alpha plutonium, beta plutonium formed from the alpha phase, beta plutonium formed from the gamma phase, and gamma plutonium was determined using an elevated-temperature X-ray metallographic technique. Fine-grained alpha that was transformed alpha yields beta yields gamma yields

beta yields alpha at 3 C/min gave fine-grained alpha phase, coarse-grained gamma, and coarse-grained gamma phase. The alpha formed from the coarse-grained gamma phase and the subsequent alpha phase were both coarsened by the gamma phase heat treatment. Conversely, alpha forms and is formed from beta transformation cycling refined the grain size of the alpha and the alpha phase. A specimen of coarse-grained alpha (300 to 500 micron average grain diameter) was slowly transformed alpha yields beta at 5 C/hr to maximize the alpha phase grain size and then rapidly transformed beta yields gamma yields beta at 20 C/min to minimize the gamma phase grain size. The resultant gamma yields was again much finer grained than the gamma phase, confirming the existence of a characteristic difference in the average grain size of alpha phase and gamma phase. Author (NSA)

N71-31283*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

I 123 PRODUCTION USE IN NUCLEAR MEDICINE BY SPALLATION OF XENON

J. W. Blue, W. K. Robert, V. J. Sodd (PHS, Cincinnati), and K. L. Scholz (PHS, Cincinnati) [1971] 13 p Presented at 1st Sco. Assembly of the World Federation of Nucl. Med. and Biol., Los Angeles, 27 Jun. 1971

(NASA-TM-X-67875) Avail: NTIS CSCL 20H

Methods for producing I-123 nuclear medical procedures by use of high current and high energy proton accelerators were investigated. A specific technique including the spallation production of Xe-123 and its decay to I-123 is described. Procedures, equipment, and results are outlined for two experiments. J.M.

N71-31318# Technische Univ., Berlin (West Germany).

TORREY OSCILLATIONS IN HETERONUCLEAR DOUBLE RESONANCE. DESCRIPTION OF THE METHOD AND ITS APPLICATIONS FOR C-13 MONO- AND DI-SUBSTITUTED MOLECULES OF NATURAL ABUNDANCE [TORREY OSZILLATIONEN IN HETERONUKLEARER DOPPELRESONANZ. BESCHREIBUNG DER METHODE UND IHRER ANWENDUNGEN AUF C-13-MONO UND DISUBSTITUIERTE MOLEKUELE NATUERLICHER HAEUFIGKEIT]

Dieter Ziessow (Ph.D. Thesis) 1969 111 p refs In GERMAN

Avail: NTIS

Damped sinusoidal oscillations that develop in a suddenly introduced HF-field at frequencies close to the nuclear resonance line, are observed for their fading and height characteristics in order to analyze the relevant relaxation mechanisms of C-13-mono- and di-substituted molecules. This method is used to determine contribution and relative signs of C-C-coupling constants in H- and C-13 concentration shifts of phenylacetylene in cyclohexane and hexamethyl phosphoric acid triamide. Transl. by G.G.

N71-31340 Wisconsin Univ., Madison.

ELECTRON SPIN RESONANCE OF POSITIVE AND NEGATIVE ION RADICALS

Russell Dean Hageman (Ph.D. Thesis) 1970 122 p

Avail: Univ. Microfilms Order No. 70-12731

Oxidation and reduction half wave potentials are reported for three-electrode polarography of seven para-substituted aniline based molecules and five para-substituted azobenzene based molecules in acetronitrile and dimethyl sulfoxide solvents. Electron spin resonance (ESR) experimental results for the same compounds are given. The spectrum of the cation of p-dimethylaminobenzonitrile in acetonitrile was reproduced very well by a computer-simulated spectrum with two inequivalent nitrogens with hyperfine splitting constants of 12.5 and 1.8 gauss, two pairs of hydrogens with constants 6.0 and 1.9 gauss, and six equivalent hydrogens with a constant of 13.4 gauss. The cation of N,N-dimethylaniline in acetronitrile was represented fairly well in the same way. The anion of N,N-dimethylaniline in dimethyl sulfoxide was also reproduced fairly well in the same manner. Huckel calculations were done in which the values of the alpha and beta semi-empirical parameters were varied within limits. Dissert. Abstr.

N71-31349 California Inst. of Tech., Bishop.

QUANTUM MECHANICAL CALCULATIONS FOR REARRANGEMENT COLLISIONS OF ELECTRONS, ATOMS, AND MOLECULES, PARTS 1 AND 2

Donald Gene Truhlar (Ph.D. Thesis) 1970 647 p

Avail: Univ. Microfilms Order No. 70-14851

Quantum mechanical calculations are presented of approximate scattering cross sections for elastic and inelastic collisions, including rearrangements, for processes involving electrons, H, He, K, H2, and HX (hydrogen halides). Electron scattering is treated for direct and exchange scattering. The transitions considered are 1s-1s, 1s-2s, and 2s-2s in H; (1 1S)-(2 1P), (1 1S)-(3 1P), and (1 1S)-(2 1S) in He; and elastic scattering and vibrational excitation of the ground state of H2. Emphasis is placed on impact energies less than about 100 eV. A version of distorted wave approximation is presented. Results and discussions for scattering off H and for excitation of the 2 1P state of He are summarized. A statistical phase theory is used to calculate cross sections and rate constants for the reactions H + HX and K + HCl. The probability of reaction is studied as a function of the incident translational energy and impact parameter and the internal states of the products. Numerical solutions of the three-body Schroedinger equation for the collinear H + H2 and D + D2 chemical reactions on an assumed potential energy surface are presented. Dissert. Abstr.

N71-31350 Cornell Univ., Ithaca, N.Y.

THE KINETICS OF THE HOMOGENEOUS, BIOMOLECULAR ISOTOPE EXCHANGE REACTIONS D2 + CH 4 YIELDS HD + CH3D, D2 + H2S YIELDS HD + HDS AND HD + HD YIELDS H2 + D2 AS STUDIED IN SINGLE-PULSE SHOCK TUBES

David Kenneth Lewis (Ph.D. Thesis) 1970 216 p

Avail: Univ. Microfilms Order No. 70-17090

A group of related atom-switching reactions between simple hydrogen and deuterium containing species was studied under homogeneous conditions in single-pulse shock tubes. Additional data were collected on the exchange reaction H2 + D2 yields 2HD, and a complete study was made of 2HD yields H2 + D2. The D2 + CH4 reaction was studied over the temperature range 1440 to 1755 K. The D2/CH4 ratios were varied from 1/3 to 10, and sample densities ranged from 0.015 to 0.047 moles/liter. An activation energy of 50 + or − 3 kcal/mole was obtained. The D2 + H2S reaction was studied in two different shock tubes over the temperature range 1250 to 1590 K and density range 0.006 and 0.04 moles/liter. The D2/H2S ratios were varied from 1/4 to 4. The activation energy is 53 + or − 3 kcal/mole. The HD + HD exchange was studied over the temperature range 1120 to 1659 K, at densities ranging from 0.01 to 0.07 moles/liter. Samples consisted of 1% to 4.5% HD in argon. The activation energy was found to be 36 + or − 2 kcal/mole. Dissert. Abstr.

N71-31387# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).

B EXCHARGE CONTRIBUTIONS IN PION(+) NEUTRON YIELDS OMEGA MESON PROTON

A. Brandao (Inst. de Phys. Nucl., Paris), D. Schiff, and J. Tran Thanh Van Mar. 1971 16 p refs

(LPTHE/71/13) Avail: NTIS

A discussion is presented on obtaining the qualitative features of experimental data in omega meson production in the framework of a conventional rho and B meson Regge pole exchange model with absorption cuts. The reasons why the B meson exchange

contribution cannot be neglected are outlined, and the Reggization, absorption, and parametrization procedures are described. It is felt that the model reproduces the qualitative behavior and gives a good quantitative fit. The formalism can be applied to pion(+) proton yields omega meson Delta (2+) hyperon. N.E.N.

N71-31419 Arkansas Univ., Fayetteville.
A STUDY OF THE AGE OF THE ELEMENTS
Michael Anthony Reynolds (Ph.D. Thesis) 1970 62 p
Avail: Univ. Microfilms Order No. 70-17194

The contents and isotopic composition of xenon from the Holbrook, Bruderheim, and Beardsley chondrites, and the xenon composition of the carbonaceous Murray chondrite are presented. The amounts of excess fissiogenic xenon (Xe-136f) and excess radiogenic xenon (Xe-129r) in the chondrites Beardsley and Holbrook were measured. The isotopic compositions of xenon released in a step wise heating experiment from the chondrite Bruderheim were determined, and the amounts of excess fissiogenic xenon (Xe-136f) and excess radiogenic xenon (Xe-129r) were calculated. Assuming Xe-136f and Xe-129r are the decay products of the extent radionuclides Pu-244 and I-129, produced in the galactic nucleosynthesis process, then the Pu/Xe and I/Xe decay intervals for these chondrites can be shown to be concordant at approximately 200 million years. Dissert. Abstr.

N71-31473# Washington Univ., Seattle. Dept. of Physics.
GROUND STATE OF He 4 MONOLAYERS ADSORBED ON INERT SUBSTRATE
C. E. Campbell and M. Schick [1970] 25 p refs Sponsored in part by AEC and NSF
(RLO-1388-603) Avail: NTIS

The properties of a system of He-4 atoms at absolute zero interacting via a Lennard–Jones potential and constrained to motion in two dimensions by an otherwise inert substrate are investigated. Results of a semiclassical calculation indicate that the ground state is that of a self bound liquid. It further indicates that a close packed solid configuration is not self bound. A quantum mechanical variational calculation is performed to obtain an upper bound on the energy of the system. A result of −0.61 K per particle is obtained at a density of 0.035 A sup -2. The relationship between this calculation and recent experiments on He-4 monolayers is briefly discussed. Author (NSA)

N71-31474# Sandia Corp., Albuquerque, N.Mex. Radiation Effects Div.
TENTATIVE METHOD FOR EXPRESSING RADIATION HARDNESS
J. M. McKenzie Mar. 1971 42 p ref Sponsored by AEC
(SC-DR-710045) Avail: NTIS

A technique is described for measuring neutron radiation hardness in terms of 14 MeV neutrons. A calibration procedure for the primary standard is given. This is based on a measured value, at 14.1 MeV, of the F-19(n,2n)F-18 cross section. An example describes the determination of the 14 MeV damage equivalence of an unknown neutron spectrum. A method to obtain the precision of the result is given. Author (NSA)

N71-31475*# Northeastern Univ., Boston, Mass. Dept. of Physics.
MASS DEPENDENCE IN INCLUSIVE REACTIONS: TRI-REGGE BEHAVIOR
Giulia Pancheri-Srivastava (Radcliffe Inst., Cambridge, Mass.) and Yogendra Srivastava May 1971 12 p refs
(Grant NSF GP-23719)
(NUB-2070) Avail: NTIS

CERN data at 19.2 GeV and Serpukhov data at 70 GeV on single particle production are analyzed to test the mass dependence formula given by the triple Reggeon graphs. Exotic cases (antiprotons and K(−) production) show agreement with this asymptotic prediction, as does the K(+) production. Pion (+−) spectra have not yet reached their asymptotic values but analysis of Serpukhov data shows such a trend. For the proton case, the triple-Pomeron coupling appears weaks. Author

N71-31476*# Translation Consultants, Ltd., Arlington, Va.
ITR PROJECT Progress Report [BERICHT UEBER ARBEITEN ZUM ITR-PROJECT]
Washington NASA Jul. 1971 48 p refs Transl. into ENGLISH from the German report K-18
(Contract NASw-2048)
(NASA-TT-F-13705; K-18) Avail: NTIS CSCL 20H

The effects of various types of emitters on neutron economy, optimization of the flight model, the dynamics of the system, thermionics, and energy transport are discussed with relation to the ITR project. Author

N71-31477# Zentralstelle fuer Atomkernenergie -Dokumentation, Frankfurt am Main (West Germany).
BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. SECTION 12: NUCLEAR SCIENCE LITERATURE OF EASTERN COUNTRIES
Benno Ensslen, comp. Dec. 1970 102 p refs
(AED-C-12-24) Avail: AEC Depository Libraries

A bibliography of mathematical applications in nuclear science of eastern countries is given. The data cover technology, industrial applications, computer programs, and nuclear energy. E.H.W.

N71-31493# Technische Universitaet, Brunswick (West Germany)
EXPERIMENTAL STUDY OF DIRECT ELECTRON-POSITRON PAIR PRODUCTION BY ELECTRONS WITH 5.8 MeV KINETIC ENERGY [EXPERIMENTELLE UNTERSUCHUNG DER DIREKTEN ELEKTRON-POSITRON-PAARERZEUGUNG DURCH ELEKRONEN VON 5.8 MEV KINETISCHER ENERGIE]
Harald Fiest (Ph.D. Thesis) 1969 38 p refs In GERMAN
Avail: NTIS

Electron-positron pair production at 5.8 MeV was measured in copper for positron energies of 1.97, 2.38, 2.59, 3.21 and 3.71 MeV. Direct positron productions in various foil thicknesses were determined by differentiation since their sum depends linear on foil target thickness and comprises indirect positron production through electron bremsstrahlung exchange. Effective positron cross sections were then calculated from angular distributions. Transl. by G.G.

N71-31494# Hamburg Univ. (West Germany). Mathematisch-Naturwissenschaftlichen Fakultaet.
AN EXPERIMENTAL DETERMINATION OF THE MAGNETIC MOMENT OF THE LAMBDA HYPERON [EINE EXPERIMENTELLE BESTIMMUNG DES MAGNETISCHEN MOMENTS DES LAMBDA-HYPERONS]
Ulrich Liebermeister (Ph.D. Thesis) 1969 97 p refs In GERMAN
Avail: NITS

The magnetic moment of the Lambda hyperon is determined in the reaction: negative pion + proton yields Lambda hyperon + neutral kaon. The Lambdas are strongly polarized at a pion impulse of 1.05 GeV/c and their spin decays Lambda yields proton + negative pion are observed in nuclear emulsions. Spin direction during decay is obtained from the anisotropic angular distribution of decay pions in the center of gravity system. Observations of 632 decays at a median nuclear precession angle of 57 deg establish the value for the magnetic moment of the Lambda hyperon as -0.70 + or − 0.15 nuclear magnetons. Transl. by G.G.

N71-31501 Ohio State Univ., Columbus.
INFRARED BANDS OF (C-12)2H2, (C-13)2H2, AND (C-12)(C-13)H2
Michael Eugene Nickelson (Ph.D. Thesis) 1969 368 p

Avail: Univ. Microfilms Order No. 70-14074

A 3.5 meter focal length vacuum spectrograph was designed and constructed to be used especially at the longer wavelength between 6 and 10 microns. The fine structure of numerous infrared bands of the linear acetylene molecule (C_2H_2) and its carbon-13 enriched isotopic species have been recorded, measured and interpreted. A molecule like acetylene having a center of symmetry does not have microwave spectra, and therefore it is necessary to study as many as possible of the infrared bands originating from the ground state to enable the determination of the best possible ground state molecular constants. This has been done from six vibration rotation bands. For some combination bands investigated, anomalous values for rotational constants were observed. Dissert. Abstr.

N71-31505# Northeastern Univ., Boston, Mass. Dept. of Physics.

PREDICTIONS FOR INCLUSIVE REACTIONS BASED ON A PARTON STRUCTURE OF HADRONS

Hyman Goldberg Jun. 1971 13 p refs

(Grant NSF GP-12336)

(NUB-2088) Avail: NTIS

It is proposed that the asymptotic single particle distributions f(x) = x(d sigma/dx) in inclusive reactions should reflect the limiting longitudinal momentum distribution, approximately nu(W sub 2)(x), of the hypothetical partons constituting a hadron. It is further argued that f(x) becomes proportional to nu(W sub2)(x) as x approaches 1. Predictions are then made for a large class of inclusive reactions based on the knowledge of nu(W sub 2)(x) from electroproduction data. For some of these (such as proton proton yields pion(+ or −) X), in which the predictions differ markedly from the Regge ones, present experiments favor this approach. Author

N71-31506# Northeastern Univ., Boston, Mass. Dept. of Physics.

SPECTROSCOPY OF THE EVEN Zn-ISOTOPES BY INELASTIC ALPHA SCATTERING

N. Alpert, Jonas Alster, E. J. Martens, and William Pickles (Michigan State Univ.) Apr. 1971 32 p refs

(Grant NSF GP-7627)

(NUB-2065) Avail: NTIS

The (alpha,alpha') reaction, at E(alpha) = 31 MeV, on Zn-68 and Zn-70 was studied with an overall energy resolution of 70 to 120 keV. Angular distributions are presented. New 3(−), 4(+) and 5(−) assignments are made on the basis of DWBA calculations. Good angular distributions were obtained for double excitation 2(+) states at 1.88 MeV in Zn-68 and at 1.78 MeV in Zn-70. Fractionation of the octupole strength has been observed. Systematics of excitation energies and strengths are discussed for Zn-64, Zn-66, Zn-68 and Zn-70. Author

N71-31507# Princeton Univ., N.J. Dept. of Physics.

AN EXPERIMENTAL STUDY OF OMEGA NEUTRAL DECAYS

James T. Dakin (Ph.D. Thesis) Feb. 1971 129 p refs

(Contract AT(30-1)-4159; Grants NSF GJ-34; NSF GU-3157)

(PURC-4159-16; TR-5) Avail: NTIS

The neutral decay modes of the omega meson(784 MeV) were studied. A sample of 532 decays from the reaction pion(−) proton yields omega meson neutron were identified from the times-of-flight and angles of the neutrons. The momentum of a single gamma from each decay was measured in a wide aperture pair spectrometer. The gamma momentum was transformed to the omega meson c.m. system. The resulting gamma (c.m.) spectrum was compared with spectra for various omega meson decay modes generated by a Monte Carlo program. The principal omega meson neutral decay, omega yields pion(0) gamma, was observed with a branching ratio (omega yields pion(0) gamma)/(omega meson yields neutrals) = (65 + or − 7)%. The upper limit for the decay omega meson yields eta meson gamma was (omega meson yields eta meson gamma)/(omega meson yields neutrals) <25%(90% confidence limit). A multibody decay, probably omega meson yields pion(0) pion(0) gamma, was observed with a branching ration (omega meson yields pion(0) pion(0) gamma)/(omega meson yields neutrals) = (35 + or − 7)% Author (NSA)

N71-31509# National Bureau of Standards, Boulder, Colo. Atomic Frequency and Time Standards Section.

THE PHYSICAL BASIS OF ATOMIC FREQUENCY STANDARDS

A. S. Risley Apr. 1971 58 p refs

(NBS-TN-399) Avail: SOD $0.60

The physical basis is discussed, and the principles are then related to the conditions under which an atom can be used as the working substance of a stable and accurate frequency standard. The three primary examples of atomic frequency standards (the hydrogen maser, the cesium beam, and the rubidium gas cell) are then discussed in terms of these principles and conditions. The functions of the fundamental parts of each device become apparent through this development. Author

N71-31514# Jyvaskyla Univ. (Finland). Dept. of Physics.

THEORETICAL CORRELATION COEFFICIENTS AS FUNCTIONS OF THE MIXING RATIO DELTA FOR TRIPLE GAMMA-RAY CASCADES WITH INTERMEDIATE TRANSITION UNOBSERVED

H. Helppi and J. Hattula Oct. 1970 8 p refs

(NP-18644; REPT-10/1970) Avail: NTIS

In directional-correlation measurements correlation functions can be obtained for many cascades simultaneously. There are often several correlations with one or more unobserved intermediate gamma rays in the cascades. Tables were compiled to facilitate the interpretation of the triple correlations with intermediate transition unobserved and the determination of the mixing ratio parameter delta. The method used in calculating the tables is described. NSA

N71-31515# Israel Atomic Energy Commission, Beersheba. Nuclear Research Center-Negev.

DEPENDENCE OF LIGHT PARTICLE PRODUCTION IN FISSION ON THE RATE OF CHANGE OF THE NUCLEAR POTENTIAL

Y. Boneh and E. Nardi 1970 19 p refs

(NRCN-252) Avail: AEC Depository Libraries

The production of the various light nuclei emitted in fission was investigated on the basis of a model in which particle emission results from a rapid change of potential energy in the neck region of the fissioning nucleus. The nucleus was treated by means of a one dimensional potential well of infinite depth. The relative emission probabilities and kinetic energies of the neutrons, protons, and the other light nuclei emitted in fission were investigated as a function of the characteristic time and shape of the rising potential. NSA

N71-31521 Washington Univ., Seattle.

TRANSITIONS FEEDING THE GROUND STATE ROTATIONAL BAND FOLLOWING (ALPHA, X NEUTRON) REACTION WHICH LEAD TO DISTORTED EVEN-EVEN NUCLEI

Stephen Mason Ferguson (Ph.D. Thesis) 1969 262 p

Avail: Univ. Microfilms Order No. 70-14751

The angular momentum dissipation mechanism in excited nuclei is studied by transitions in rotational bands of even-even distorted rare earth nuclei. In moderate energy (20-60 MeV) bombardments which lead to even-even deformed residual nuclei, the relative intensities of the ground band rotational transitions are difficult to understand in terms of the formulation conventionally used to analyze isomer ratio measurements. In particular, the average spin at which the photon cascade enters the ground band

is much smaller than predicted. It is suggested that nuclear angular momentum is dissipated in rotational bands built on vibrational and two quasi-particle states. Dissert. Abstr.

N71-31524 Wisconsin Univ., Madison.
RESONANCE PRODUCTION IN PION(−) PROTON INTERACTIONS AT 7.0 GeV/c
Robert Malcolm Morse (Ph.D. Thesis) 1969 270 p
Avail: Univ. Microfilms Order No. 70-3639

The 30" hydrogen bubble chamber was used to study inelastic negative pion proton interactions at 7.0 GeV/c. Two tantalum plates mounted in the chamber allowed reconstruction of 3,100 negative pion proton yields negative pion neutral pion neutral pion proton events from a sample of 5,600 negative pion proton yields negative pion proton k photons k = 1,2,... In addition 6,000 negative pion proton yields negative pion, negative pion, positive pion proton events were reconstruced from the approximately 300,000 pictures in this exposure. These inelastic processes were found to be dominated by rho meson production, and multipion resonance production. A sub 1, A sub 2 and A(1230) as well as numerous nuclear isobars. All the effective mass distributions obtainable from the negative pion neutral pion neutral pion proton and negative pion negative pion positive pion proton final states are presented as well as the cross sections for resonant production in these final states. Dissert. Abstr.

N71-31545# Oak Ridge National Lab., Tenn.
SELECTED ABSTRACTS OF WORLD LITERATURE ON PRODUCTION AND INDUSTRIAL USES OF RADIOISOTOPES (FROM NSA OCTOBER – DECEMBER 1970)
Martha Gerrard and P. S. Baker Apr. 1971 37 p refs
(Contract W-7405-eng-26)
(ORNL-IIC-30-Pt-4) Avail: NTIS

Approximately 320 abstracts of domestic and foreign publications on production and use of radioisotopes and radiation, selected from the October – December 1970 issues of Nuclear Science Abstracts, are presented. Author (NSA)

N71-31546# Princeton Univ., N.J. Joseph Henry Labs.
PHENOMENA IN MULTIPARTICLE PRODUCTION PROCESSES
Henry D. I. Abarbanel Mar. 1971 19 p refs Presented at the Am. Phys. Soc. Meeting, Washington, D.C. 26 Apr. 1971
(Contract AT(30-1)-4159)
(PURC-4159-19; Conf-710413-1) Avail: NTIS

A review is given of multiparticle production experiments and the kinds of results that have emerged within the last two years. The limiting behavior of the cross sections are discussed. Inclusive production that bears directly on the question of the nature of diffractive dissociation or equivalently on the structure of the Pomeranchuk singularity in J-plane physics is treated. NSA

N71-31556# California Univ., Livermore. Lawrence Radiation Lab
AN INDEX TO THE EXPERIMENTAL DATA OF NEUTRON INDUCED REACTIONS. VOLUME 3
R. J. Howerton, S. T. Perkins, C. P. Altamirano, and K. L. Hill Oct. 1970 812 p refs Sponsored by AEC
(UCRL-50400-Vol-3) Avail: NTIS HC$9.00/MF$0.95

An index to the data of neutron-induced reactions contained in the Experimental Cross Section Information Library (ECSIL), as of October 1, 1970, is presented. Three permutations of the reaction index, a key to current conventions, and a summary table are presented. Author (NSA)

N71-31563# Japan Atomic Energy Research Inst., Tokyo. Osaka Lab.
[RADIATION CHEMISTRY RESEARCH] Annual Report, 1 Apr. 1969 – 31 Mar. 1970
1970 171 p refs In JAPANESE; ENGLISH summary
(JAERI-5026) Avail: AEC Depository Libraries

Results from experiments in radiation chemistry are reported. Information include low energy interactions with solid polymers, energy transfer by radiation luminescence in high and low energy regions, radiation effects on metal acetylacetonates, and radiation induced polymerization. For industrial applications data include grafting techniques for the production of polyvinyl chloride, polyester fibers, and wood-polymer combinations. Electron beam curing is also examined. E.H.W.

N71-31565# Junta de Energia Nuclear, Madrid (Spain).
[NUCLEAR ENERGY RESEARCH] Biennial Memoirs, 1968 – 1969
1970 190 p refs In SPANISH
(NP-18700) Avail: AEC Depository Libraries

Nuclear energy research on the fuel cycle, nuclear reactors, desalination of water, isotopes, high energy physics, solid state physics, molecular biology, radiobiology chemistry, and metallurgy for the years 1968 and 1969 is briefly summarized. The lines of study followed are described and the experimental results are only indicated. NSA

N71-31566# Washington Univ., Seattle. Dept. of Physics.
THE 1/omega SUM RULES AND LONG RANGE CORRELATIONS IN BINARY SOLUTIONS
C. E. Campbell Dec. 1970 18 p refs Sponsored by AEC
(RLO-1388-599) Avail: NTIS

The 1-omega sum rules are derived for two component uniform many body systems. The density fluctuations are quantized for the case when both components satisfy Bose statistics. Information about the long wavelength behavior of the liquid structure functions is deduced from both the sum rules and the zero point density fluctuations. Author (NSA)

N71-31568# Cornell Univ., Ithaca, N.Y. Materials Science Center.
EFFECT OF ELECTRIC FIELD AND TEMPERATURE ON THE RADIATIVE LIFETIME OF THE F CENTER
Lynn F. Stiles, Jr. (Ph.D. Thesis) Jun. 1970 135 p refs
(Contract AT(30-1)-3464)
(NYO-3463-23; Rept-1329) Avail: NTIS

The radiative lifetime of the excited F center at 4.2 K and the changes in the radiative lifetime induced by an applied electric field and by increasing temperature were measured in KCl, KF, and NaF with sufficient precision to test recent models for the relaxed excited states. The results were in semiquantitative agreement with the predictions of the mixed-state model recently proposed. The quantities measured were the luminescent decay time (using a pulse sampling technique), the relative luminescent yield (using conventional techniques), and the emission line shape function. Lifetimes at 4.2 K were 717 + or − 15 nsec for KCl, 380 + or − 20 nsec for KF, and 117 + or − 5 nsec for NaF. Changes in lifetime were measured for applied dc fields of 0 to 140 kV/cm at 4.2 K. The ability of the mixed state model to explain other recent experiments on the excited F center is discussed, as well as some of its limitations. Author (NSA)

N71-31572# General Electric Co., Schenectady, N.Y. Knolls Atomic Power Lab.
NEUTRON CROSS SECTIONS AND STRENGTH FUNCTIONS OF Sm 147 AND Sm 150
H. M. Eiland, S. Weinstein, and K. W. Seemann 1971 7 p refs Presented at the 3d Conf. on Neutron Cross Sect. and Technol., Knoxville, Tenn., 15 Mar. 1971
(Contract W-31-109-eng-52)
(KAPL-P-3930; Conf-710301-2) Avail: NTIS

The total cross sections of Sm-147 and Sm-150 were determined by transmission measurements upon samples of

high isotopic purity. Measurements were made at the RPI Linear Accelerator with a lithium-glass scintillation detector at 25 meters. Energy resolution varied from 2 to 10 nsec/m. Resonance parameters were extracted for Sm-147 resonances up to 1200 eV and for Sm-150 resonances up to 1500 eV. Author (NSA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N71-30402# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.

PROCEDURE FOR NUMERICAL CALCULATION OF TOROIDAL EQUILIBRIUM CONFIGURATION OF SYMMETRICALLY ROTATING, FIELD-FREE PLASMAS [EIN VERFAHREN ZUR NUMEISCHEN BERECHNUNG TOROIDALER GLEICHGEWICHTSKONFIGURATIONEN VON ROTATIONSSYMMETRISCHEN, FELDFREIEN PLASMEN]

Lutz Janicke Oct. 1970 55 p refs In GERMAN

(JUL-700-PP) Avail: AEC Depository Libraries

Under the assumption that the plasma is field-free and is separated from the external magnetic field by a thin current layer, the calculation of equilibrium configurations means the solution of a free boundary value value problem. A numerical method is first developed for the solution of the simple boundary value problem in which all boundaries are assumed stable. An iteration method is formulated which, starting with an estimated location of the free boundary (plasma surface), so deforms it gradually that from step to step the condition at the free boundary is always fulfilled. After the convergence of the method is shown by a simple example, a series of equilibrium configurations that appear for the coil system of a hard core theta pinch is discussed. Author (NSA)

N71-30403# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.

PRODUCTION AND INCLUSION OF A DENSE AND HOT PLASMA IN THE SPINDLE-CUSP CONFIGURATION [ERZEUGUNG UND EINSCHLUB EINES DICHTEN UND HEIBEN PLASMAS IN DER SPINDELCUSP-KONFIGURATION]

Erwin Kugler Oct. 1970 74 p refs In GERMAN

(JUL-708-PP) Avail: AEC Depository Libraries

The properties and construction of a spindle-cusp compression experiment are described. The measurement results of the plasma parameters during the preheating, compression, and confinement phases are reported. The various models of the plasma loss from the cusp geometry are calculated and compared with the experimental results. Author (NSA)

N71-30407# Max-Planck-Institut fur Physik und Astrophysik, Munich (West Germany).

THERMAL PLASMA AS A NORMAL INTENSITY EMITTER IN THE WAVELENGTH RANGE 1100 TO 3100 A [DAS THERMISCHE PLASMA ALS INTENSITAETSNORMALSTRAHLER IM WELLENLAENGENBEREICH VON 1100 BIS 3100 A]

G. Boldt Jul. 1969 85 p refs In GERMAN

(MPI-PAE/EXTRATERR-29) Avail: AEC Depository Libraries

With the help of a cascade electric arc, a thermal plasma was produced. It emits a series of optically thick spectral lines in the vacuum-uv range. The intensities in the core of these lines are given by the Kirchhoff – Planck function and can be calculated from knowledge of the plasma temperature. Interpolation between the central intensities of the optically thick lines yields, at each location in the range between 1100 and 3100 A, an absolute intensity scale with which the intensity of the arc spectrum at each location of this wavelength range can be determined absolutely. The temperature measurement was made by four different spectroscopic methods independent of other intensity norms and gave 12,540 K with an uncertainity of + or − 1 to + or − 2%. An uncertainty from + or − 10 to + or − 20%, therefore, results for the absolute intensity value. The reproducibility error is kept in the limits of less than + or − 2%. Therefore, an absolute-intensity normal emitter of high accuracy and reproducibility is available for the vacuum-uv range between 1100 and 3100 A. Author (NSA)

N71-30408# Centre de Recherchee En Physiques des Plasmas, Lausanne (Switzerland).

STUDY OF SHORT WAVELENGTH INSTABILITIES IN THE CONFINEMENT OF A COLLISION DOMINATED PLASMA BY A ROTATING MAGNETIC FIELD

F. Troyon Oct. 1970 14 p refs Supported by the Swiss Natl. Sci. Found.

(LRP-42/70) Avail: AEC Depository Libraries

A collision-dominated plasma confined by a rotating magnetic field is stable if f approximately > 0.02 Nu sub i where f is the frequency of rotation and Nu sub i the ion collision frequency. Short-wavelength perturbations are the most difficult to stabilize. Growth rates of parametric instabilities are shown to be so large as to make impossible any attempt to use a frequency much lower than the above limit. A simple interpretation of a wide region of instability, which cannot be ascribed to any parametric instability, is given in terms of an equivalent negative resistance. Author (NSA)

N71-30409# Akademiya Nauk SSSR, Novosibirsk. Inst. Yadernoi Fiziki.

SELECTION OF OPTICAL PARAMETERS FOR STELLARATOR MAGNETIC SYSTEMS [O VYBORE OPTIMALNYKH PARAMETROH MAGNITNOI SISTEMY STELLARATORA]

V. I. Volosov and A. V. Komin 1970 19 p refs In RUSSIAN

(IYAF-8-70) Avail: AEC Depository Libraries

The magnetic field in a stellarator is ordinarily created by two systems of windings. One creates a longitudinal, toroidal magnetic field. The other is a system of spiral windings consisting of n (n is equal to 2 or 3) pairs of helical conductors at an angle beta to the axis of the torus. The plasma particles are bent around the axis of the torus in such a manner as to compensate for toroidal particle drift. The total bending angle at the perimeter is important in calculating plasma diffusion. If the bending angle varies with radius, the force lines at various radii are crossed. The magnitude of the crossing or width theta determines the stabilization of low-frequency, drift oscillations in the plasmas. If it is assumed that the ratio of currents in the windings is chosen in an optimum fashion, geometrical factors such as the angle of inclination of the spiral windings to the axis of the torus and the ratio of the large and small radii of the torus can be varied in order to obtain maximum values of the width and bending angle. Equations are given to calculate these parameters, and the results are presented graphically. NSA

N71-30410# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

SOURCE OF SYNTHESIZED PLASMA [ETUDE D'UNE SOURCE DE PLASMA DE SYNTHESE]

10 Mar. 1970 54 p refs In FRENCH

(NP-18722) Avail: AEC Depository Libraries

A source of slow neutralized ions operating with a weak flux of neutral argon was developed from a Kaufman source whose classical extraction system had been replaced by a single grid. This source produces a plasma beam with a velocity of 10 km/s. At 80 cm from the source a charged-particle density 5 million per cubic centimeter was readily obtained. The electron temperature

which can be reduced to beneath 1000 K (less than that of the neutralizer), is controlled. The characteristics of this source make it very useful for ionospheric flight simulation. Author (NSA)

N71-30421# Paris Univ., Orsay (France).
ACCELERATION OF A PLASMA BY A MOVING CURRENT LAYER [ACCELERATION D'UN PLASMA PAR UNE COUCHE DE COURANT EN MOUVEMENT]
Philippe Jourdan 1970 99 p refs In FRENCH
(NP-18539) Avail: AEC Depository Libraries

The structure of a current layer induced in a theta pinch was experimentally studied. The following phenomenon was revealed: the gas encountered by the shell in its radial motion is ionized before being set into motion. The plasma crossing the current layer is accelerated up to a velocity approaching that of the layer. Inside the layer, the ions are in the A III ionization state (the state in which the atom has lost two electrons) and are subjected to an adiabatic compression, while the electrons receive thermal energy. For the two electrons liberated, this energy is approximately equal to the kinetic energy of an ion with the velocity of the current layer. This energy transfer is the result of the resistive diffusion of the plasma through the magnetic field and results from the classical resistivity due to Coulombian electron-ion collisions. However, the thermal energy thus received by the electrons is lost in inelastic collisions with plasma ions, and because of the particular nature of the gas, is finally lost by radiation. The result is an accumulation of plasma behind the current layer. NSA

N71-30434# Academy of Sciences (USSR), Leningrad. Inst. of Technical Physics.
DETERMINATION OF THE BOUNDARY OF HIGH FREQUENCY WAVE ABSORPTION BETWEEN THE ELECTRON CYCLOTRON AND THE LOW-HYBRID FREQUENCY
B. V. Galaktionov, V. E. Golant, V. V. Dyachenko, and O. N. Shcherbinin 1970 11 p refs In RUSSIAN; ENGLISH summary
(FTI-295) Avail: AEC Depository Libraries

The boundary of the absorption of high-frequency waves by plasma was determined from the study of conditions under which plasma was maintained by hf power. From the variation of plasma parameters, some critical values were found when the plasma density decreased abruptly. The results can be related to the theory of absorption by linear wave transformation. Author (NSA)

N71-30435# Academy of Sciences (USSR), Leningrad. Inst. of Technical Physics.
HIGH FREQUENCY PLASMA HEATING NEAR THE LOW-HYBRID FREQUENCY
B. V. Galaktionov, V. V. Dyachenko, and O. N. Shcherbinin 1970 14 p refs In RUSSIAN; ENGLISH summary
(FIT-282) Avail: AEC Depository Libraries

Some experiments on the hf heating of a hydrogen plasma are described. The boundary efficient heating was found at the magnetic fields corresponding to the low hybrid frequency. The energy input decreased considerably below the critical field. The plasma density was determined when the efficiency of the coupling circuit was at a maximum. From an analysis of the diamagnetic pressure distribution along the discharge tube, it became possible to separate the diamagnetic effects due to ions and electrons. The energy of ions and electrons was nearly the same. Author (NSA)

N71-30583# Uppsala Univ. (Sweden). Inst. of Physics.
STUDY OF NONLINEAR INSTABILITIES
Kjell Oestberg Aug. 1970 33 p refs
(UUIP-722) Avail: AEC Depository Libraries

Equations describing resonant interaction between three waves in a plasma in the fixed-phase approximation were investigated. It is assumed that the coupling is explosively unstable and that dissipative effects can be neglected. The development in time of the wave amplitudes and phases is studied by means of numerical methods. An analytic expression is derived for the time of explosion and it is shown how this time depends on the initial values. Author (NSA)

N71-30640# Paris Univ., Orsay (France). Lab. de Physique des Plasmas.
KINETIC STUDY OF THE HeI POPULATIONS IN A DENSE HELIUM PLASMA AND THE EFFECTS OF ABSORPTION ON THE SPECTRAL LINES [ETUDE CINETIQUE DES POPULATIONS DE HEI DANS UN PLASMA DENSE D'HELIUM, INFLUENCE SUR L'ABSORPTION DES RAIES SPECTRALES]
Jean Bretagne Dec. 1970 61 p refs In FRENCH; ENGLISH summary
(NP-18740; LP-122) Avail: AEC Depository Libraries

A spectroscopic investigation was made on the afterglow of a helium plasma produced by a focused laser beam. It was found that the spectral lines undergoing a harmonic Stark effect, indicated by satellite lines from the forbidden transitions 4 3F yields 2 3P and 4 1F yields 2 1P, are not absorbed by this type of plasma. Consequently, their profiles cannot be attributed to self absorption. The effect of absorption on the isolated HeI lines, from which the temperature and electron density were determined, was calculated. The plasma recombination coefficients were determined from calculations made on the population of the lowest energy levels, assuming almost stationary conditions. The type of equilibrium assumed by these levels is indicated. Author (NSA)

N71-30677# Academy of Sciences (USSR), Leningrad.
CONDITIONS OF PLASMA HEATING AT ELECTRON CYCLOTRON RESONANCE
N. I. Vinogradov, K. A. Podushnikova, and B. P. Poldskin 1970 15 p refs In RUSSIAN
(NP-18635) Avail: AEC Depository Libraries

Conditions of formation of a group of fast particles (up to 100 keV) and heating dynamics of this group and of the main electron plasma component (up to 100 eV) were studied during electron cyclotron heating. It was found that the efficiency of heating of the main component and of the group of fast electrons depends on the position of the resonance region in the chamber. The rate of heating of the main group is approximately 10 to the 8th power eV/sec and the rate of heating of the fast particles is approximately 7 $\times$ 10 to the 9th power eV/sec. Analysis of the data revealed that heating of the main component may occur in a nonresonance region and, for the fast particles, in a resonance region. NSA

N71-30733# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Atomnoi Energii.
EXPERIMENTAL STUDY OF PLASMA FOCUSING OF ION BEAMS
V. V. Zhukov, A. I. Morozov, and G. Ya. Shchepkin 1970 36 p refs In RUSSIAN
(IAE-1974) Avail: AEC Depository Libraries

The results are presented from an experimental investigation of plasma focusing using models of plasma lenses. It is demonstrated that plasma focusing in a simple system with closed electron drifts is actually realized in good agreement with the theory. The refracting force is considerably greater than in ordinary electrostatic or magnetic "vacuum" lenses. NSA

N71-30918*# Scripta Technica, Inc., Washington, D.C.
ON THE MOTION OF CHARGED PARTICLES IN A PLASMA IN THE PRESENCE OF A MAGNETOHYDRODYNAMIC SHOCK WAVE [O DVIZHENII ZAPRYAZHENNYKH CHASTITS V PLAZME PRI NALICHII MAGNITOGIDRODINAMICHESKOY UDARNOY VOLNY]

V. P. Korobeynikov et al NASA Oct. 1970 8 p refs Transl. into ENGLISH from Zh. Prikl. Mekhan. i. Tekhn. Fiz. (Moscow), no. 6, 1964 p 89–92
(Contract NASw-2036)
(NASA-TT-F-13815) Avail: NTIS CSCL 20I

Mathematical expressions for the particle motion are developed for two particular cases of shock wave propagation in a perfect gas. The motion of a plane shock wave at constant velocity and the motion of a spherical shock wave formed during a strong point explosion in an infinitely conductive gas are considered. The calculations show that for a single interaction with a spherical shock wave, particle acceleration will not occur. The results also show that a particle may be accelerated by a factor greater than three when it collides with oncoming, strong, plane shock waves. N.E.N.

N71-31044# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
QUANTUM STATISTICS OF THERMAL PLASMAS IN EQUILIBRIUM. 1: THE METHOD OF EFFECTIVE POTENTIALS
G. Kelbg and W. Ebeling 1970 14 p refs In RUSSIAN; ENGLISH summary Presented at 3d Conf. on Statist. Phys. and Phys. Kinet. L'Vov, USSR, Jun. 1970
(ITF-70-93-P; Conf-700648-2) Avail: AEC Depository Libraries

A statistical theory for the thermodynamic properties of non-degenerate nonrelativistic plasmas is developed. Following the method of effective potentials, the calculation of the partition function for plasmas is reduced to the corresponding classical problem. The result of numerical calculations for the binary Slater sums and the second virial coefficient of hydrogen plasmas are given. Author (NSA)

N71-31045# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
QUANTUM STATISTICS OF THERMAL PLASMAS IN EQUILIBRIUM. 2: DENSITY AND FUGACITY EXPANSIONS
W. Ebeling and G. Kelbg 1970 14 p refs In RUSSIAN; ENGLISH summary Presented at 3d Conf. on Statist. Phys. and Phys. Kinet., L'Vov, USSR, Jun. 1970
(ITF-70-94-P; Conf-700648-1) Avail: AEC Depository Libraries

The expression for the second virial coefficient of the density expansion is calculated explicitly in the case of small plasma parameters. Using this result, the free energy of the quantum plasma is derived without approximations up to the order N(5/2), where N is the density. In the case of lower temperatures, the density expansions are replaced by fugacity expansions. The latter describe the formation of atoms and molecules as shown for the example of hydrogen plasmas. Author (NSA)

N71-31046 Ohio State Univ., Columbus.
DIAGNOSTIC STUDIES OF HYDROGEN PLASMAS HEATED BY TWO PHASE EXCITATION AT THE CYCLOTRON FREQUENCY
Roger Raymond Kemppel (Ph.D. Thesis) 1969 85 p
Avail: Univ. Microfilms Order No. 70-14051

Radio frequency exciter coils were designed which produce rotating electric and revolving magnetic fields, rotating and revolving at a frequency of 4.255 MHz which corresponds to the hydrogen ion cyclotron frequency at a magnetic field strength of 2790 gauss. The theory of the motion of an ion in rotating electric and revolving magnetic fields is presented. Charged particles escaping from the ends of the magnetic mirror were detected through the use of a Faraday cup used as a retarding field energy analyzer. A method is presented by which an estimate of the atomic hydrogen ion density of the plasma of 1.88 × 10 to the 12th power ions per cubic centimeter was obtained. The energy of the atomic hydrogen ion present in the plasma in the greatest number was shown to be 385 eV. The maximum energy of the H ions was shown to asymptotically approach 930 eV. Dissert. Abstr.

N71-31143 Princeton Univ., N.J.
DRIFT INSTABILITY IN COLLISIONLESS ALKALI METAL PLASMAS
Peter Alexander Politzer (Ph.D. Thesis) 1969 100 p
Avail: Univ. Microfilms Order No. 70-14235

Measurements of low frequency oscillations in collisionless, low beta, alkali metal Q device plasmas are reported. These oscillations are conclusively identified as density-gradient-driven drift waves by the agreement between experiment and the predictions of the linear theory with regard to frequency, wave number, and stabilization by ion Landau damping. The linear theory of collisionless drift wave is modified to take into account effects of cylindrical geometry. Also considered are radial gradients in the zero order diamagnetic drift and plasma rotation frequencies. The enhancement of resonant particle effects by the finite length of the plasma column is computed. The experimental results demonstrate the importance of centrifugal and Coriolis force effects in determining the oscillation frequency. Dissert. Abstr

N71-31144 Ohio State Univ., Columbus.
ION-CYCLOTRON HEATING OF A HYDROGEN PLASMA BY TWO-PHASE EXCITATION
Abdul Kabir Abdul Bashir (Ph.D. Thesis) 1969 100 p
Avail: Univ. Microfilms Order No. 70-13976

A two phase exciter coil system has been designed and constructed. The system is energized by two 30-Kw amplifiers operated at 4.225 MHz in quadrature. A static magnetic field, in the form of a mirror machine was used to confine the plasma. The exciter coil system placed at the center of the mirror machine, produced a revolving magnetic field and a rotating induced electric field. The energy gained by the hydrogen plasma from a 4.225 MHz radio frequency field was studied experimentally. The frequency 4.225 MHz corresponded to the cyclotron resonance frequency for atomic hydrogen at 2792 gauss. The existence and extent of the resonance effect was found by measuring the light output from plasma by using a CdS resistive photocell and a photomultiplier as detectors. At resonance conditions, the intensity of the light was found to be increased markedly. Dissert. Abstr.

N71-31156 Ohio State Univ., Columbus.
INVESTIGATION OF A LOW POWER MPD ARC
Norman Lee Boling (Ph.D. Thesis) 1969 150 p
Avail: Univ. Microfilms Order No. 70-13983

The ignition of the arc of and the plasma produced by an MPD engine operating at less than 3 KW and designed to function as a plasma wind tunnel for the testing of models and development of diagnostic techniques in flowing plasmas is studied. The dependence of electron density upon gas(argon) input rate, arc current, and magnetic field is investigated. The electron density is found to exhibit peaks when the cyclotron frequency, due to the externally applied magnetic field, is approximately equal to the plasma frequency. The use of a Langmuir probe to measure directed ion speed is described and experiments indicate that this probe behaves like an ideal plane probe. Dissert. Abstr.

N71-31245# Systems Science and Software, La Jolla, Calif.
A STUDY OF EQUATIONS OF STATE/OPACITY OF IONIZED GASES, VOLUME 1 Interim Progress Report, 20 Oct. 1969–20 Sep. 1970
Howard D. Cohen, Donald E. Parks, and Albert G. Petschek Apr. 1971 126 p refs
(Contract DASA01-70-C-0030)
(AD-722709; SR-485; DASA-2597-1) Avail: NTIS CSCL 20/9

Developments in the calculation of the opacity and equation

of state of ionized gases are described. A principal result in the CAPO code, a highly modular computer program for the calculation of thermodynamic and optical properties. Owing to its modular structure CAPO can be easily modified to allow improvements in the description of the physics. CAPO is based on the ionic model of a plasma. The system is viewed as an assemblage of ions and free electrons and each species is considered separately in the determination of the material properties. Free-free, bound-free and bound-bound processes contribute to the opacity. The line absorption is calculated in terms of a cluster or band model. Pressure ionization is treated in a manner that allows a thermodynamically consistent evaluation of thermodynamic functions. Considerations of the effect of pressure ionization on the electronic partition function suggest a reasonable method for avoiding the difficulties associated with the termination of the summation over states at quantum numbers where the binding energy is about equal to the pressure lowering of the ionization potential. Author (GRA)

N71-31247# Oak Ridge National Lab., Tenn.
PERTURBATION THEORY IN TOROIDAL PLASMA
Philip B. Burt Mar. 1971 16 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3351) Avail: NTIS

A plasma confined within a toroidal conductor of infinite conductivity is considered from the point of view of the magnetohydrodynamic description. The equilibrium description for an axially symmetric system leads to an integrodifferential equation connecting the toroidal current density and the scalar pressure. The assumption that this system can be described by a perturbation treatment in which the perturbation parameter is the inverse aspect ratio is shown to be invalid except for special cases. The demonstration is based upon explicit construction of the kernel of the integrodifferential equation in a form suitable for examining the limit of large aspect ratio. This kernel contains both positive and negative powers of the aspect ratio as well as logarithmic functions of this quantity. Finally, in the limit of indefinitely large aspect ratio, the kernel is shown to exist. Author

N71-31248# Los Alamos Scientific Lab., N.Mex.
PLASMA EXPERIMENTS WITH A THREE-METER THETA PINCH
R. F. Gribble, E. M. Little, W. E. Quinn, and R. E. Siemon Feb. 1971 11 p refs
(Contract W-7405-eng-36)
(LA-4611) Avail: NTIS

Extensive modifications to the Scylla 4 theta pinch include a change from a one to a three meter length coil, an increased energy storage, a new improved triggering system, and the addition of a crowbar system. The compression field is extended to 120 microseconds by means of crowbar switches. Double exposure holographic interferometry, side-on streak photographs, and neutron emission measurements establish the following comparison with the previous one meter version of the experiment: The plasma confinement time and neutron emission were extended from 3 to 10 microseconds. The scaling of confinement time and plasma temperature from the one meter device is accounted for by simple end loss and shock compression considerations. An m = 1 wobble of the plasma column is observed in the present experiment and is interpreted in terms of plasma rotation propagating from the ends at approximately the Alfven speed. Author (NSA)

N71-31249# Los Alamos Scientific Lab., N.Mex.
FEEDBACK SYSTEMS ON LINEAR THETA PINCHES WITH HELICAL FIELDS
K. I. Thomassen Aug. 1970 14 p refs
(Contract W-7405-eng-36)
(LA-4598) Avail: NTIS

Stabilization of a theta-pinch plasma column by 1 = 0 and 1 = 1 coils to produce helical fields is discussed. The nature of the forces produced by helical fields is outlined and a nonlinear bang-bang feedback system is proposed for controlling plasma position. Author (NSA)

N71-31508# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences Section.
ELECTROMAGNETIC GAIN MECHANISMS IN HOMOGENEOUS PLASMAS
M. R. Wohlers Jun. 1971 46 p refs Submitted for publication
(RE-411J) Avail: NTIS

A study of the flow of time-varying electromagnetic energy is presented which indicates that a wide variety of energy gain mechanisms exist within homogeneous plasmas; the required energy is supplied by the static currents and magnetic fields existing in the plasma. The specific case of two independent electromagnetic waves interacting within a homogeneous plasma is studied in great detail, and general conditions are derived, in terms of the propagation constants of such waves, that enables one to determine when energy gain will be achieved. This study also leads to certain conclusions: gain is possible with certain waves even though the waves are individually stable; a gain mechanism exists that is the result of a static magnetic field alone; and certain gain mechanisms exist at all frequencies and for all nonzero values static fields, i.e., these mechanisms have no thresholds. Specific gain mechanisms in solid-state or collision-dominated plasmas are also discussed. Author

N71-31519# STD Research Corp., Pasadena, Calif.
CURRENT DISTRIBUTION IN CROSSED-FIELD ACCELERATORS. PART 4: PROJECT SUMMARY AND APPLICATION Final Report, 1 Jul. 1969 - 30 Sep. 1970
George S. Argyropoulos and S. T. Demetriades Arnold Air Force Station, Tenn. AEDC Apr. 1971 73 p refs
(Contract F40600-70-C-0001)
(AD-722443; STD-70-6-Pt-4; AEDC-TR-71-91-Pt-4) Avail: NTIS CSCL 20/9

Realistic analytical modeling of crossed-field accelerators is obtained by computing the development of turbulent magnetohydrodynamic boundary layers on the walls and the coupled two-dimensional distributions of current density, plasma properties, and fluid velocity, temperature and pressure over the entire channel. The analysis is based on methods developed in previous work by the authors, and considers the effects of electron nonequilibrium, thermal and concentration diffusion, suppression of turbulence by magnetic fields, finite reaction rates, and electron energy relaxation. Application to the Hirho channel gives excellent agreement with experimental results. It is shown that the reduction of the Hall field in Faraday channels is due to the fact that local axial current density is present over most of the flow, even when there is no net current leakage along the channel. The modeling is carried out by a well-documented computer program, of which a program listing, Fortran source deck, and explanation of input and output formats are provided. This work has demonstrated that realistic computations are necessary for the design of efficient magnetohydrodynamic channels. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N71-30472# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
MODULATION SPECTROSCOPY OF SURFACE SUPERCONDUCTIVITY OF Pb FILMS [SPETTROSCOPIA MODULATA DELLA SUPERCONDUTTIVITA SUPERFICIALE DI FILM DI Pb]

P. L. Indovina, S. Onori, and E. Tabet 10 Mar. 1970 30 p refs In ITALIAN
(ISS-70/6) Avail: AEC Depository Libraries

A high sensitivity differential technique was applied to the investigation of the microwave surface impedance of superconductors. Some measurements of the critical fields H sub c3 and H sub cF of Pb films performed by detecting the first derivative dR sub s/dH of the real part of the microwave surface impedance as a function of an external magnetic field are presented. It is shown that, in the temperature range 5.42 to 7.22 K, a Pb film exhibits only a first order phase transition in a magnetic field, whereas for T < or = to 5.42 K, there is also a second order transition connected with the appearance of a surface critical field. Good agreement is found with theoretical predictions. Author (NSA)

N71-30518# Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
COMMENTS ON THE SCATTERING OF CHARGED PARTICLES BY SINGLE CRYSTALS. 1: THE GENERAL CASE
C. S. Newton and L. T. Chadderton Feb. 1971 24 p refs
(RISO-239) Avail: AEC Depository Libraries

The scattering of a beam of fast charged particles by a single-crystal lattice is discussed in detail, and a qualitative picture is drawn of the quantum-classical transition. Author (NSA)

N71-30728# Southern Illinois Univ., Carbondale. School of Technology.
TEMPERATURE AND PRESSURE EFFECTS OF ATOMIC REPULSION IN AEROSPACE ELECTRONIC MATERIALS Final Scientific Report, 1 Jun. 1968 – 15 Dec. 1970
J. L. Amoros Dec. 1970 24 p refs
(Grant AF-AFOSR-1587-68)
(AD-722449; AFOSR-71-0815TR) Avail: NTIS CSCL 20/12

The objective of the research was to ascertain the laws followed by the repulsive potential of the atoms in terms of temperature, pressure and crystal structure. The determination of whether or not this behavior is an atomic function, and the role of the electronic structure of the atom were sought. To avoid the effect produced by the creation of imperfections, X-ray thermal expansion and compressibility were determined as a function of crystal structure type and chemical composition. The variation of the electron cloud of the different elements was studied by the method of the Selected Electron Shell. Author (GRA)

N71-30734# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONDUCTION MECHANISMS IN EPITAXIAL GALLIUM ARSENIDE
Robert J. Kunkle (M.S. Thesis) Mar. 1971 71 p refs
(AD-722650; GE/EE/71-17) Avail: NTIS CSCL 20/12

Electrical conduction in high quality epitaxial GaAs is quantatively explained for low fields and temperatures from 4K to room temperature. Other conduction mechanisms found in less pure GaAs are also discussed. A technique for making Hall bridged in epitaxial material is described, as well as the technique and equipment for Hall effect measurements. A computer routine is presented which solves for impurity concentrations from Hall mobility and resistivity in the temperature range 15K to 30K together with room temperature Hall coefficient. Author (GRA)

N71-30880*# Translation Consultants, Ltd., Arlington, Va.
PLASMA WAVES AND SUPERCONDUCTIVITY IN QUANTIZING SEMICONDUCTOR (SEMIMETAL) FILMS AND LAYERED STRUCTURES [PLAZMENNYYE VOLNY I SVERKHPROVODIMOST V KVANTUYUSHCHIKH POLUPROVODNIKOVYKH (POLUMETALLICHESKIKH) PLENKAKH I SLOISTYKH STRUKTURAKH]
E. A. Pashitskiy et al Washington NASA Jul. 1971 19 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 15, no. 10, 1970 p 1594 – 1606
(Contract NASw-2038)
(NASA-TT-F-13747) Avail: NTIS CSCL 20L

It is shown that a specific mechanism of coupling degenerate conductance electrons, the result of virtual acoustic plasmon exchange, occurs in quantizing semiconductor (semimetal) films and layered structures with a reasonably high mobility of free carriers. As a result, the critical temperature of the superconductive transition in such systems can be noticeably higher than in massive specimens. Author

N71-31081*# Scientific Translation Service, Santa Barbara, Calif.
ASSOCIATION OF OLIVINE, GARNET AND CHROME-DIOPSIDE IN A YAKUSTK DIAMOND [ASSOTSIATSIYA OLIVIN-GRANAT-KHROMDIOPSID IZ YAKUTSKOGO ALMAZA]
N. V. Sobolev et al Washington NASA Nov. 1970 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 192, no. 6, 1970 p 1349 – 1353
(Contract NASw-2035)
(NASA-TT-F-13819) Avail: NTIS CSCL 20L

Diamonds from the Udachnaya vein were found to contain olivine (2 inclusions), chrome-diopside, garnet (2 inclusions), and concretions of garnet and chrome-diopside. These data make possible a more exact evaluation of the distribution of scattered concentrations of K2O at high pressures in the pyroxene phase. Author

N71-31094*# Translation Consultants, Ltd., Arlington, Va.
THE HALL EFFECT IN POLYCRYSTALLINE SEMICONDUCTOR TEST SPECIMENS [ZJAWISKO HALLA W POLIKRYSTALICZNYCH PROBKACH POLPRZEWODNIKOWYCH]
A. Kobendza et al Washington NASA Jul. 1971 12 p refs Transl. into ENGLISH from Arch. Elektrotech. (Warsaw), v. 19, no. 4, 1970 p 855 – 863
(Contract NASw-2038)
(NASA-TT-F-13680) Avail: NTIS CSCL 20L

Description of the model of a polycrystalline semiconductor film assuming that the grains and the boundaries between them have different conductivities and Hall mobilities. The effect of grain boundaries on the measured values of conductivity, Hall mobility, and concentration of current carriers is estimated. Using this model, the relation between Hall mobility and the illumination intensity in polycrystalline cadmium selenide is determined with allowance for the production technique of semiconductor films. Author

N71-31099 Illinois Univ., Urbana.
THE THERMAL EXPANSION OF AMMONIUM CHLORIDE NEAR THE ORDER-DISORDER TRANSITION
George Ernest Fredericks (Ph.D. Thesis) 1969 72 p
Avail: Univ. Microfilms Order No. 70-13317

A theory is presented to explain the behavior of the volume of ammonium chloride near the first order transition at 242 K. This theory is able to account for a first order transition by considering the coupling between an elastic lattice system and the order-disorder system. The lattice system gives rise to non-singular terms in the Helmholz Free Energy of the total system. The order-disorder system gives rise to singular term in the free energy. The coupling of the two subsystems then produces the possibility of the first order transition. The thermal expansion at constant pressure of ammonium chloride was measured in order to test the predictions of the theory. A three terminal bridge measurement of an electrical capacitance determined by the length of single crystals of ammonium chloride was used to measure the thermal expansion of

ammonium chloride. A discussion of the experimental arrangement is given. The measured thermal expansion showed sample dependence. Dissert. Abstr.

N71-31100 Princeton Univ., N.J.
OPTICAL PROBING OF ACOUSTO-ELECTRIC DOMAINS IN CADMIUM SULFIDE
Elliott Samuel Kohn (Ph.D. Thesis) 1969 135 p
Avail: Univ. Microfilms Order No. 70-14219

The effect of acousto-electric domains on the transmission of monochromatic light through cadmium sulfide was studied with samples of several crystallographic orientations. It was found that the domains caused a decrease in the optical transmission which was most pronounced for light whose photon energy was close to the band edge. The polarization dependence of the transmission modulation reflected the double optical absorption edge known to exist in hexagonal semiconductors. The mechanisms likely to be responsible for the decrease in the transmission are discussed and it is shown that photo-elastic scattering cannot account for the results. Dissert. Abstr.

N71-31101 Ohio State Univ., Columbus.
TEMPERATURE DEPENDENCE OF THE RESONANCE LINEWIDTHS IN FERROMAGNETIC THIN FILMS
Charles Tecumseh Shirkey (Ph.D. Thesis) 1969 79 p
Avail: Univ. Microfilms Order No. 70-14097

The temperature dependence of the resonance linewidths of standing spin wave modes in ferromagnetic thin films was measured. It is found that the linewidths obey the relation Delta H sub k(T) equals Delta H sub K(O) times (1-a sub k T to the 3/2 power) where Delta H sub k(O) is the linewidth at absolute zero of the mode characterized by a wave vector, k. These results are consistent with a two magnon relaxation process induced by inhomogeneities in the demagnetization field. It is concluded that this process is the dominant mechanism for relaxation of the higher order modes and contributes a major part of the broadening of the low order modes. Dissert. Abstr.

N71-31151 Ohio State Univ., Columbus.
FAST NEUTRON SPUTTERING FROM POLYCRYSTALLINE AND MONOCRYSTALLINE GOLD CRYSTALS
Barry Philip Fairand (Ph.D. Thesis) 1969 99 p
Avail: Univ. Microfilms Order No. 70-14012

The atomic sputtering by fast neutrons incident upon a polycrystalline gold target and <100> and <111> monocrystalline gold targets was determined. An upper limit for the atomic sputtering by thermal neutrons was also determined. The fast neutron sputtering ratios observed for the monocrystalline gold targets and the polycrystalline gold target are in reasonable agreement with sputtering ratios predicted by a sputtering model where atom ejection is due to long range focusing collisions along the <110> close packed crystal direction. Based on the comparison between theory and experiment, a focusing mechanism appears to contribute significantly to the number of sputtered atoms while the random mechanism is of secondary importance. Dissert Abstr.

N71-31155 State Univ. of New York, Stony Brook.
THE QUANTUM SIZE EFFECT IN BISMUTH
Narciso Garcia (Ph.D. Thesis) 1969 126 p
Avail: Univ. Microfilms Order No. 70-2475

Bismuth films have been epitaxially grown on hot mica substrates. The structure of these films consists of a mosaic of equally oriented crystallites. The plane of the films coincides with the trigonal plane of Bi. The thickness and the temperature dependence of the resistivity, the Hall effect and of the magneto-resistance have been studied. These three quantities are used to evaluate the carrier concentration. Large variations with temperature in the carrier concentration, which are in agreement with the predictions of size quantization, have been observed. Moreover rho (T) exhibits some very interesting features when the film thickness is less than 400 A. Although the origin of these anomalies is not understood at the moment they are greatly influenced by impurity content. Dissert. Abstr.

N71-31157 Wisconsin Univ., Madison.
EFFECT OF CROSS-LINKING ON THE THERMAL CONDUCTIVITY OF POLYSTYRENE BETWEEN 0.3 and 1 K
Barry Lee Berman (Ph.D. Thesis) 1969 81 p
Avail: Univ. Microfilms Order No. 70-3476

The thermal conductivities of one stock sample of polystyrene and two heavily cross-linked samples have been measured between 0.3 and 1 K. The cross-linking agent was divinylbenzene in amounts of 20% and 40% by weight. It is found that the thermal conductivity shows a slight increase with increased cross-linking, and a greater increase over the stock polystyrene. It is shown that thermal conductivity in this temperature range can be understood in terms of the scattering of longitudinal phonons by two processes, one which results in a frequency independent mean free path (boundary scattering), and the other which results in a mean free path which varies inversely as the square of the phonon frequency. The frequency dependent mean free path is consistent with the scattering of phonons by an amorphous material. Dissert. Abstr.

N71-31158 Oregon State Univ., Corvallis.
LOW TEMPERATURE DEFORMATION CHARACTERISTICS OF HIGH PURITY ZIRCONIUM SINGLE CRYSTALS
David George Goodrich (Ph.D. Thesis) 1970 111 p
Avail: Univ. Microfilms Order No. 70-14130

High purity single crystals of zirconium were produced and tested at liquid helium temperature in a cryostat. Intermediate test temperatures were obtained with the specimen immersed in the proper refrigerant. The flow stress versus temperature curve was found to level off at a temperature of approximately 120 K which is 330 K lower than the lowest temperature observed previously for the phenomena. A pronounced peak in the curve of activation volume versus temperature was found at 230 K. Two possible explanations are proposed for the peak in activation volume. Inverse strain rate sensitivity was observed in three specimens two of which were tested at room temperature and one in liquid nitrogen. No evidence of basal slip or twinning was found at any temperature. Dissert. Abstr.

N71-31187# Pennsylvania State Univ., University Park. Materials Research Lab.
ROLE OF TRAPPING PROCESSES IN SOLID STATE RADIATION DOSIMETRY Progress Report, 1970–1971
Feb. 1971 36 p refs
(Contract AT(30-1)-3409)
(NYO-3409-9) Avail: NTIS

Research on radiation dosimetry by polymer electret depolarization is described. Also, the characterization of non-luminescent near-insulating materials by the measurement of thermally stimulated currents and thermally stimulated depolarization is discussed. Radiation dose measurements based on carrier trap filling are considered. Equipment and results are discussed including the measurement of pyroelectric coefficients and the characterization of lunar materials. NSA

N71-31188 Pennsylvania State Univ., University Park.
STRESS INDUCED LATTICE IMPERFECTIONS IN VARIOUS POLYCRYSTALLINE MATERIALS DETERMINED BY X-RAY DIFFRACTION
William Rodger Stitt (Ph.D. Thesis) 1969 152 p
Avail: Univ. Microfilms Order No. 70-13890

An investigation was conducted to determine the extent to which imperfections induced in a polycrystalline material by

mechanical means could be measured. Various materials were subjected to normal laboratory treatment, such as grinding and filing, and the defects introduced were studied by precision lattice parameter measurements, density measurements, and x-ray line profile analysis. The types of imperfections which were observed in this study were point defects, line defects, and strain (both micro and macro). Considerable attention was given to the reproducibility of lattice parameter measurements. It was found that the error in an individual measurement was a few parts per million (3 ppm for silicon), but that a much larger error exists between individual determinations. Dissert. Abstr.

N71-31189 Iowa Univ., Iowa City.
CRYSTALLINITY AND DENSITY IN PERMEATION OF CARBON DIOXIDE AND WATER VAPOR THROUGH POLYMERS
Kook-Wha Koh (Ph.D. Thesis) 1970 124 p
Avail: Univ. Microfilms Order No. 70-15613

The effect of polymer crystallinity and density on the permeability to carbon dioxide and water vapor of polyethylene, polypropylene, nylon 6, and cellulose acetate and to nitrogen of polyethylene was investigated. The data fit the model equation developed by considering the semi-crystalline polymer to be heterogeneous. The permeability data were taken by the cup method for water vapor and by two methods for carbon dioxide and nitrogen. The crystallinity was calculated from X-ray diffractograms and density measured by the modified ASTM D-792 method. The perm-selectivity between penetrants was investigated. The perm-selectivity of polyolfin was lower than nylon 6 and cellulose acetate. The values of perm-selectivity in the same polymer were not consistent due to the great difference of penetrant molecular sizes. Dissert. Abstr.

N71-31215# City Coll. Research Foundation, New York.
OPTICAL PROPERTIES OF SEMICONDUCTORS Final Scientific Report, 1 Jan. 1969 - 31 Mar. 1971
Narkis Tzoar Apr. 1971 85 p refs
(Grant AF-AFOSR-1676-69)
(AD-722865; AFOSR-71-1095TR) Avail: NTIS CSCL 20/12

The program of investigations was designed to lead to a better understanding of the electronic structure and the optical properties of semiconducting materials used in modern solid state electronic circuitry for detection, amplification and communication in aerospace environments. This is essential to the design of optical detectors and devices. The study involved calculations of the high-frequency conductivity and dielectric properties of semiconductors including anisotropic features, taking into account electronic and ionic correlations and fluctuations, effects of magnetic fields, impurities and band structure. The principal technique used was the many-body perturbation method, extended to include valence states, strong electron-phonon and radiation interactions and the effect of local impurity potentials. Author (GRA)

N71-31257 Kansas State Univ., Manhattan.
AN INFRARED STUDY OF CHEMISORBED SULFUR COMPOUNDS ON EVAPORATED METAL FILMS
Marc Duncan Constant (Ph.D. Thesis) 1970 103 p
Avail: Univ. Microfilms Order No. 70-16624

An attempt has been made to determine the interaction of several sulfur compounds with in situ evaporated Pt and Ge films by infrared spectroscopy. The exposure of Pt films to H2S at pressures up to 19.32 cm did not result in any detectible bands due to an adsorbed species. Evidence for a strong interaction with the Pt surface was obtained through concurrent Pt-Co band studies. Platinum films previously exposed to H2S did not appear to chemisorb CO and were therefore inactive or poisoned. Also, the disappearance of chemisorbed CO was observed upon exposure of a film to H2S and the Pt-CO band frequency was observed to increase. These results suggested that the H2S interacted strongly with the Pt surface. Dissert. Abstr.

N71-31321# Technische Univ., Berlin (West Germany). Fakultaet fuer Bergbau und Huettenwesen.
STUDIES ON THE CRYSTALLIZATION PROCESS OF IRON AND IRON ALLOYS IN THE HIGH TEMPERATURE MICROSCOPE [UNTERSUCHUNGEN DES KRISTALLISATIONSABLAUFS VON EISEN UND EISENLEGIERUNGEN IM HOCHTEMPERATURMIKROSKOP]
Wolf-Dieter Schneider (Ph.D. Thesis) 1969 111 p refs In GERMAN
Avail: NTIS

The crystallization process in molten iron, steel and eutectic containing iron-carbon-X-alloys (X = silicon, vanadium, chromium) is studied by high temperature microscopy and by photography of the changing metal surface. The ledeburite crystallization takes place by forming two vertical growths of differing velocities and lattice formations. In the predominant and edge oriented growth direction much higher crystallization velocities are observed than in the sidewise growth direction. It is shown that lattice changes in the crystallization process depend on quenching velocity, chemical composition, melting temperature, and additives and can be observed correspondingly at the melt surface. The quantitative effects of these parameters on the crystallization process are not considered. Transl. by G.G.

N71-31323# Technische Univ., Berlin (West Germany). Fakultaet fuer Bergbau und Huettenwesen.
THE EFFECT OF ADDITIVE ATOMS ON COPPER DIFFUSION IN SINGLE NICKEL CRYSTALS [DER EINFLUSS VON FREMDATOMEN AUF DIE DIFFUSION VON KUPFER IN NICKEL-EINKRISTALLEN]
Heinrich Ulrich Helfmeier (Ph.D. Thesis) 1969 80 p refs In GERMAN
Avail: NTIS

Volumetric diffusion of copper in nickel is studied and the effects of small impurities are assessed for the temperature region of 843.3 C to 1050 C. Impurities of 0.18% titanium do not affect the copper diffusion coefficient in the investigated temperature range; alloys containing 0.17% gold and 0.27% palladium also do not produce any changes in diffusion velocities at 903.3 C and 1000 C, but show a pronounce increase at 843.3 C in comparison to pure crystal. A probe containing 2.8% arsenide exhibits the highest diffusion coefficient increase for copper in single nickel crystals. Transl. by G.G.

N71-31324# Technische Univ., Berlin (West Germany). Fakultaet fuer Allgemeine Ingenieurwissenschaften.
SELF-DIFFUSION AND DIFFUSION OF SULFUR AND THALLIUM IN SELENIUM [SELBSTDIFFUSION UND DIFFUSION VON SCHWEFEL UND THALLIUM IN SELEN]
Peter Braetter (Ph.D. Thesis) 1969 88 p refs In GERMAN
Avail: NTIS

The diffusion behavior of selenium semiconductors is studied by evaluating self-diffusivity of selenium single crystals and the diffusion of sulfur and thallium in polycrystalline selenium and selenium single crystals. Measured temperature effects on diffusion coefficients and on hole formation enthalpy, as well as absorption spectra are displayed in Arrhenius diagram. It is proposed that the self-diffusion in single selenium crystals is governed by a hole mechanism and that the sulfur diffusion produces a stronger anisotropic effect. Thallium diffusion in polycrystalline selenium followed up to 150 C the Arrhenius correlation; above this temperature, the Arrhenius curve showed decreasing diffusion values that are attributed to the formation of TlSe. Transl. by G.G

N71-31325# Technische Univ., Berlin (West Germany). Fakultaet fuer Allgemeine Ingenieurwissenschaften.
HELICON WAVES IN MERCURY SELENIDE [HELIKONWELLEN IM QUECKSILBERSELENID]
Hans-Jochen Danckwerts (Ph.D. Thesis) 1969 121 p refs In

GERMAN
Avail: NTIS

The helicon resonance in mercury selenide is observed after excitation of stable helicon waves in single squares and cylinders of the mercury selenide crystal through a magnetic field at low temperatures. It is found that helicon oscillating frequencies of the described geometrical shapes are directly proportional to the magnetic induction and depend on the Hall constant and the geometric dimensions of the crystal. Oscillation damping times are only determined by the electrical conductivity. Rotation of square shaped HgSe probes in a magnetic field produces new oscillatory helicon formations depending on the turning angle. Transl. by G.G.

N71-31326# Technische Univ., Berlin (West Germany).
STUDIES ON THE MECHANISM OF SURFACE RECOMBINATION AT THE PHASE BOUNDARY GERMANIUM-ELECTROLYTE [UNTERSUCHUNG DES MECHANISMUS DER OBERFLAECHENREKOMBINATION AN DER PHASENGRENZE GERMANIUM-ELEKTROLYT]
Reinhard Blaser (Ph.D. Thesis) 1969 103 p refs In GERMAN
Avail: NTIS

A quantum mechanical electrochemical model is developed and used to analyze charge transfer characteristics in the phase boundary between a germanium semiconductor and electrolyte with emphasis on surface recombination. The model is based on measurements of surface recombination rates, electrode flow, differential capacity and differential conductivity. It is found that a special reactivity space is formed between the germanium surface and the homogeneous electrolyte bulk. The different ion concentration in this reactivity space is responsible for electrode properties and redox processes; its ion combination changes during the polarization cycle. Transl. by G.G.

N71-31342 Ohio State Univ., Columbus.
ELECTRON PARAMAGNETIC RESONANCE OF GADOLINIUM (3) IN CADMIUM SULFIDE SINGLE CRYSTALS
Richard Rayner Schehl (Ph.D. Thesis) 1969 89 p
Avail: Univ. Microfilms Order No. 70-14092

The electron paramagnetic resonance spectra of Gd(3+) in single crystals of cadmium sulfide have been observed at liquid nitrogen temperature. The Gd(3+) substituting for the Cd ion in the host crystal was fitted with a spin Hamiltonian with operators that transform like the spherical harmonics. The spectrum of an additional Gd(+) site was also observed and believed to be due to an interstitial site. This spectra fitted another spin Hamiltonian. The parameters are given for both the substitutional site and the interstitial site. Dissert. Abstr.

N71-31360 Illinois Univ., Urbana.
THE HEAT CAPACITY OF AMMONIUM CHLORIDE NEAR THE ORDER-DISORDER TRANSITION
Paul Michael Schwartz (Ph.D. Thesis) 1969 94 p
Avail: Univ. Microfilms Order No. 70-13476

A theory is presented to explain the behavior of ammonium chloride near the first order phase transition at 240 K in terms of a physical model that has singular and nonsingular parts of the free energy coupled together. The singularity is normally associated with a second order phase transition, but it can lead to a first order transition in the model discussed. The heat capacity at constant pressure was measured in the neighborhood of the transition in order to test the predictions of the theory. An A.C. technique was used to measure the heat capacity of ammonium chloride single crystals, and a discussion of the experimental factors involved in making the measurement is given. Values were obtained for parameters occurring in the theory and are compared with those obtained from other experiments on ammonium chloride and from theoretical predictions. In particular, the volume dependence of the interaction responsible for the transition is in qualitative agreement with a prediction based upon an octopole-octopole, electrostatic interaction. Dissert. Abstr.

N71-31445# Technische Univ., Berlin (West Germany).
ON THE FRICTION- AND ABRASION-BEHAVIOR OF SINGLE GOLD CRYSTALS [UEBER DAS REIBUNGS- UND VERSCHLEISSVERHALTEN VON GOLDEINKRISTALLEN]
Klaus Hack (Ph.D. Thesis) 1969 88 p refs In GERMAN
Avail: NTIS

Single gold crystals of varying orientations are studied for their friction and abrasion behavior in dry gliding drives. Observed are the effects of sliding path, gliding velocity, contact surface geometry, and various atmospheric conditions on friction deformation of crystal surfaces. Measurements show the effects of surface pressure on the friction coefficient; the coefficient increases corresponding to surface pressure loads and produces adhesive wear. Structural X-ray analyses on friction deformed (111)-crystal surfaces establish a thin polycrystalline surface layer whose planes exhibit a characteristic direction-oriented shift from the original (111)-level with a depth of about 50 millimicrons. Transl. by G.G.

N71-31448# Technische Univ., Berlin (West Germany). Fakultaet fuer Allgemeine Ingenieurwissenschaften.
NONRADIATIVE BAND-BAND TRANSFERS IN SEMICONDUCTORS CAUSED BY THE ELECTRON-ELECTRON EXCHANGE EFFECT [STRAHLUNGSLOSE BAND-BAND-UEBERGAENGE IN HALBLEITERN AUFGRUND DER ELEKTRON-ELEKTRON-WECHSELWIRKUNG]
Dieter Schoene (Ph.D. Thesis) 1969 76 p refs In GERMAN
Avail: NTIS

Electron-electron exchange effects are used to calculate the life times of excess electrons in semiconductors. Electron band wave functions are approximated and integrated into transfer probability calculations for some III-V semiconductors. Obtained life times for nonradiative electron transfers in semiconductors with small energy vacancies are established for InSb, InAs, and GaSb. Transl. by G.G.

N71-31453# Naval Ordnance Lab., White Oak, Md.
Pb(1-X)Sn(X)Te EPITAXIAL FILMS: NORMAL GROWTH AND HEAT TREATMENT; SPECIAL GROWTH Final Report, Oct. 1969 - Oct. 1970
Harold R. Riedl and Richard B. Schoolar 15 Mar. 1971 46 p refs
(AD-722786) Avail: NTIS CSCL 20/12

Various growth techniques and heat treatments have been investigated in order to produce high quality epitaxial films of Pb(1-x)Sn(x)Te with controlled values of both the Pb/Sn ratio and the PbSn/Te ratio. The first primarily controls the value of the band gap, and the second, the value of the carrier concentration. Also included in the report are: synthesis of the bulk, x-ray analysis, film thickness determination, Hall measurements, plastic mounting of the films and photoconductive properties. Author (GRA)

N71-31454*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LEED AND AUGER ELECTRON SPECTROSCOPY STUDY OF OXYGEN ADSORPTION ON TUNGSTEN (110)
Ronald G. Musket and John Ferrante Washington Aug. 1971 35 p refs
(NASA-TN-D-6399; E-6117) Avail: NTIS CSCL 11F

Several aspects of oxygen adsorption on W(110) have been examined. Quantitative oxygen coverage as a function of oxygen

exposure was determined in an Auger electron spectroscopy study. In particular coverages down to less than 0.02 monolayer of oxygen were detectable. The initial slope of the coverage against exposure curve provided a value of 0.23+ or −0.05 for the initial sticking coefficient. Exposure dependence of the elastically back-scattered electrons and the electrons that suffered only a surface plasmon energy loss was found to be approximately the same as for the oxygen coverage. The total electron-impact cross section for the desorption of oxygen from an oxygen-saturated W(110) surface was determined to be approximately 1.5 × 10 to the minus 20th power for 1365-eV electrons. Author

N71-31457# American Micromation Industries, Inc., Philadelphia, Pa.
EFFICIENCY OF X-RAY LUMINESCENCE AND THERMOLUMINESCENCE OF LITHIUM FLUORIDE CRYSTALS [EFFEKTIVNOST RENTGENO- I TERMOLYUMINESTSENTSII KRISTALLOV FTORISTOGO LITIYA]
M. Grube et al Feb. 1971 11 p refs Transl. into ENGLISH from Latv. PSR Zinat. Akad. Vestis, Fiz. Teh. Zinat. Ser. (Latvia SSR), no. 4, 1970 p 37–43 Sponsored by AEC Prepared for ANL
(ANL-Trans-874) Avail: NTIS

The effect of activation by magnesium and calcium on thermoluminescence and X-ray luminescence of LiF crystals was investigated. Activation by magnesium strongly influences thermoluminescence yield, but it has little effect on X-ray luminescence efficiency. With an Mg concentration of 0.3 wt %, the maximum observed thermoluminescence yield is 10 to the 10th power quanta/g-rad. Calcium impurities act mainly to increase the thermoluminescence in the crystal with mixed activators – LiF: Mg (0.3 wt %), Ca (0.01 wt %, as used for dosimetry). Author (NSA)

N71-31458# Tyco Labs., Inc., Waltham, Mass.
SYNTHESIZED ENERGY CONVERTING MATERIALS Final Technical Report, 24 Feb. 1970–23 Feb. 1971
23 Feb. 1971 22 p
(Contract N00140-70-C-0315)
(AD-722785) Avail: NTIS CSCL 20/2

Octahedra and rod shaped crystals of semiconducting ferromagnetic chalcogenide spinel (Cu(x)Cd(1-x)Cr2Se4) have been grown from molten CdCl2 by slow cooling or by the travelling heater method (THM). Slow cooling of its solution in molten CdCl2 resulted in single crystal octahedra up to 3-4 mm size. The THM grown rods were 8 mm in diameter and 35-40 mm long. THM grown rods were quite inhomogeneous in composition and magnetic behavior. Some of this polyphase material was semiconducting and showed ferromagnetism at temperatures up to 80C. Author (GRA)

N71-31484# California Univ., Los Angeles. Dept. of Physics.
ULTRASONIC INVESTIGATION OF SUPERCONDUCTING PAIRS, SPIRAL SPINS, AND NUCLEAR SPIN WAVES Final Report
Moises Levy Jan. 1971 13 p refs
(Grant AF-AFOSR-1847-70)
(AD-722453; AFOSR-71-0003TR) Avail: NTIS CSCL 20/12

The results of research on the following investigations are reported: the study of the properties of type I and type II superconductors by using ultrasonic techniques; the study of electron phonon interaction for transverse waves when the electromagnetic skin depth is comparable to the ultrasonic wavelength; the study of the interaction of nuclear spin waves with transverse ultrasonic waves; and the study of spin phonon interaction in the spin spiral phase of the rare earth metals in the presence of an external magnetic field. Author (GRA)

N71-31485# Grumman Aerospace Corp., Bethpage, N.Y. System Sciences Section.
CHARACTERIZATION OF BULK SEMICONDUCTORS FROM THE MEASUREMENT OF THEIR TRANSPORT PROPERTIES
Denes Fekete Jul. 1971 39 p refs
(RM-515) Avail: NTIS

Transport coefficients which govern the behavior of bulk semiconductors under applied electric and magnetic fields were measured as a function of temperature. The theory is developed for the analysis of isotropic semiconductors and a system is described for the measurement of the coefficients over a wide temperature range from cryogenic to room temperatures. The system contains various novel features including a precise, stable sample holder and provisions for achieving rapid temperature stabilization. The system is then applied to the characterization of a sample of InSb. Author

N71-31486# Northeastern Univ., Boston, Mass. Dept. of Physics.
QUANTUM MOBILITY AND NUCLEAR SPIN ECHO DAMPING IN IMPURE CRYSTALS
Allan Widom May 1971 8 p refs
(NUB-2069) Avail: NTIS

The low temperature loss of configurational entropy in impure crystals is attributed to the quantum mobility of the impurities. The resulting specific heat peaks have not yet been observed probably because of the extremely small values of the mobility bandwidths. It is shown that the mobility bandwidth can be measured by nuclear spin echo damping. The damping factor is shown to have an oscillatory character in this limit as opposed to the usual classical form. Practical limits to the method reveal an approximate lower bound on detectable widths. Author

N71-31510# Boston Univ., Mass.
COINCIDENCE MOESSBAUER STUDIES OF SOLID STATE PHENOMENA Progress Report, 1 Jun. 1970–31 May 1971
Gilbert R. Hoy Feb. 1971 16 p
(Contract AT(30-1)-3973)
(NYO-3973-8) Avail: NTIS

Progress is reported for continuing research in coincidence Mossbauer spectroscopy of solid state phenomena. Methods of correcting raw data and comparing them to time filtering theory were developed, along with a technique for investigating ionic spin relaxation and other selective excitations. Following initial testing of the new methods and computer programs, a number of Mossbauer scattering experiments were conducted. Their results are discussed and graphically illustrated. A.C.R.

N71-31525# Carnegie-Mellon Univ., Pittsburgh, Pa.
[CALCULATION OF CRYSTAL PROPERTIES AND PREPARATION OF CaF2 CRYSTALS] Progress Report, 1 May 1970–30 Apr. 1971
Joseph O. Artman 1 Mar. 1971 6 p refs
(Contract AT(30-1)-4075)
(NYO-4075-10) Avail: NTIS

Analytic and experimental work is reported for on-going research in nuclear metallurgy. Emphasis during this period was on preparation, spectrum analysis, and crystal structure determination of a number of complexes, particularly Np-doped CaF2. A superconducting magnet was developed and will be used for Zeeman splitting observations in CaF2:Np(6+) specimens before the end of the next contract interval. A.C.R.

N71-31560# North Carolina State Univ., Raleigh.
DEFORMATION SUBSTRUCTURE IN POLYCRYSTALLINE ALUMINA
Paul F. Becher 30 Jun. 1970 13 p refs
(Contract AT(40-1)-3328)
(ORO-3328-13) Avail: NTIS

Transmission electron microscopy techniques were employed in a study of substructure in two sintered, 20 micrometers alumina bodies. The assintered microstructures were found to contain dislocation networks which were often associated with intragranular porosity. Twinned structures and rhombohedral and basal types were also observed but were relatively infrequent. Amorphous second phases commonly located at triple points were characteristic of the lower purity (99% Al2O3) material, and were also observed in the 99.9% purity material, but only in very limited amounts. The plastic deformation achieved in these bodies at elevated temperatures (T< or = 1420) appeared to be primarily related to dislocation motion. In conjunction with this dominant plastic flow mechanism, grain boundary shearing was observed to contribute to obtainable strains, being associated with displacements involving (1) interfacial pores, (2) grain boundary dislocations, or (3) amorphous interfacial second phases. Author

N71-31585# Notre Dame Univ., Ind. Physical Electronics Group.
FUNDAMENTAL RESEARCH ON EMISSION MATERIALS AND SURFACE PHYSICS Final Report, 31 Jul. 1967 – 31 Jul. 1970
Alex A. Petrauskas and Edward A. Coomes 10 Mar. 1971 74 p refs
(Contract N00014-67-A-0242-0002)
(AD-723855) Avail: NTIS CSCL 20/3

A value of 6.9 plus or minus 0.5 eV has been measured for the work function of a (211) plane of thermally smoothed tungsten field emitter, using an improved probe-hole technique. A compensation is shown to exist between the Richardson constants for recrystallized W and Mo filaments, which may be explained by a Gaussian distribution of fundamental patches superimposed on the micropatches. Periodic deviations in the Schottky effect for Nb, Ta and Ta-on-Nb yield a Wa which is at variance with the Miller-Good theory. A more advanced many-body analysis is needed to explain the results. Author (GRA)

N71-31588# Office of Naval Research, London (England).
SOME RESEARCH ON SUPERCONDUCTIVITY IN SWITZERLAND
Robert A. Hein 6 Apr. 1971 28 p refs
(AD-723811; ONRL-R-8-71) Avail: NTIS CSCL 20/12

The report describes research concerned with superconducting materials being done at the Laboratorium fur Festkorperphysik of the Eidgenossischen Technichen Hochschule (ETH) Zurich, the Institut de Physique de al Matiere Condensee, (University of Geneva), and at the Institut de Physique Experimentale (University of Lausanne). Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N71-31190 Arizona Univ., Tucson.
THE EFFECT OF ELECTROSTATIC FIELDS ON FLAME SPREAD RATES OF SOLID PROPELLANT
Stewart William Turner (Ph.D. Thesis) 1970 185 p
Avail: Univ. Microfilms Order No. 70-16376

The effect of electric fields on the flame spread rate of igniting solid propellant is discussed. The experimental effort was directed toward the determination of three specific characteristics for each of four different formulations of solid propellant. The specific characteristics obtained were: (1) charged particle (positive ion, negative ion, and electron) concentrations of the solid propellant flames, (2) electrostatic field plots of the flame zone and environs during flame spread tests, and (3) flame spread rate variations over a wide range of applied voltage conditions for each of the four propellant formulations. Dissert. Abstr.

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N71-30615# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
COMPUTER PROGRAM IN BASIC FORTRAN 4 FOR THE PERFORMANCE CALCULATION OF ROCKET PROPELLANTS AND GUN POWDERS [RECHENPROGRAMM IN BASIC FORTRAN 4 ZUR LEISTUNGSBERECHNUNG VON RAKETENTREIBSTOFFEN UND TREIBLADUNGSPULVERN]
F. Volk and H. Bathelt 31 Oct. 1970 52 p In GERMAN
(ICT-9/70) Avail: NTIS

A computer program in basic FORTRAN 4 to determine the performance of rocket propellants and gun powders, consisting of the elements C, H, O, N, Al, and Cl, is described. ESRO

N71-30817*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY INVESTIGATION OF DIFFUSER WALL BLEED TO CONTROL COMBUSTOR INLET AIRFLOW DISTRIBUTION
Albert J. Juhasz and James D. Holdeman Washington Jul. 1971 18 p refs
(NASA-TN-D-6435; E-6278) Avail: NTIS CSCL 21E

Velocity profile control tests were conducted with a short annular diffuser equipped with wall bleed capability. The diffuser area ratio was 4, and the length to inlet height ratio was 1.5. Results show that the diffuser radial exit velocity profile may be shifted towards either the inner or outer diffuser wall by, respectively, bleeding off a small fraction of the total flow through the inner or outer wall. Based on these results, application of the diffuser bleed technique to a gas turbine combustor should be considered. The advantages of such a combustor could be shorter length, reduced idle exhaust emissions, and improved altitude relight capability. Author

N71-30866*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CAPTIVE-FIRED TESTING OF SOLID ROCKET MOTORS: SPACE VEHICLE DESIGN CRITERIA (CHEMICAL PROPULSION)
James W. Kordig, Jr. (Hercules, Inc.) and Russell B. Keller, Jr., ed. Mar. 1971 101 p refs
(NASA-SP-8041) Avail: NTIS CSCL 21H

Problems involved in a successful captive-fired test of solid rocket motors and their current solutions are discussed. The test objectives and adequate provisions for achieving these objectives are determined during motor design and test stand design. Thrust measurement, measuring chamber and igniter pressure, and preventing nozzle flow separation, and spin and centrifuging are among the considerations. Finally, equipment and procedures for monitoring motor phenomena during testing are treated. E.M.C.

N71-31102# Council for Scientific and Industrial Research, Pretoria (South Africa). Foreign Language Information Service.

NOTE ON THE DEVELOPMENT OF PULSE JETS WITHOUT FLAP VALVES [NOTE SUR LE DEVELOPPEMENT DES PULSO-REACTEURS SANS CLAPETS]

R. Marchal et al Feb. 1970 25 p refs Transl. into ENGLISH from the publ. 'Association Technique Maritime et Aeronautique, Session 1963' p 1–20 *Its* Ref. No. 827

Avail: NTIS

The development and the methods used from the invention of pulse jets without flap valves (1944) up to the development of the most recent high speed machines are discussed. The basic principles of the Escopette, the Ecrevisse, machines streamlined for the propulsion of drones, the static pulse jet group and finally the machine without shock waves, capable of functioning at speeds approaching the speed of sound are described. Author

N71-31103*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ROCKET THRUST THROTTLING SYSTEM Patent Application

John W. Gregory, inventor (to NASA) 10 p Filed 18 Jan. 1971 (NASA-Case-LEW-10374-1; US-Patent-Appl-SN-107380) Avail: NTIS CSCL 21H

A method for throttling the thrust of a liquid bipropellant rocket engine is presented. A small vortex fluid amplifier is located at the entrance to the oxidizer tube of a conical injector. The vortex fluid amplifier differentially controls the oxidizer flow by means of a variable vortex flow field to throttle the thrust of the rocket engine. NASA

N71-31110 Jet Propulsion Lab., Calif. Inst of Tech., Pasadena. Propulsion Div.

NITRIC OXIDE EMISSION STUDIES OF INTERNAL COMBUSTION ENGINES

F. H. Shair and J. H. Rupe *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 23–35 refs (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 21G

A comparison of the nitric oxide emissions within the exhaust for various mixtures of natural gas and gasoline is emphasized. A pneumatically driven atomizer permitted the CFR engine to be operated with gasoline fuel-air-ratios down to 0.05. At fuel-air ratios below 0.05, misfiring occurred when either natural gas or gasoline fuels were used. In a natural gas-gasoline fuel mixture, the nitric oxide concentration in the emissions decreased almost linearly with increasing concentration of natural gas, based on a fuel-air ratio near 0.063. It is shown that the concentration of NO in the exhaust is always less when natural gas is the fuel, except for a limited range of operation at very lean equivalence ratios where misfiring precluded a direct comparison. Author

N71-31111*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

AN ALL-CARBON RADIATING NOZZLE FOR LONG BURNING SOLID PROPELLANT MOTORS

R. L. Bailey and J. I. Shafer *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1970 p 36–46 refs (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 21H

Three 27-kg solid propellant motors were static-fired in three tests to demonstrate the feasibility of using nozzles based on all-carbon composite materials for long-burning, high-performance solid rocket propulsion systems suitable for planetary orbit-insertion applications. The successful completion of these firings represents a significant advancement in long-burning solid propellant motor technology in that: (1) the motor burning times are comparable to those required for space missions; (2) the nozzle weights are about 0.4-0.6 that estimated for equivalent flight-weight ablative nozzles; and (3) unlike the ablative nozzles, the all-carbon radiating nozzles can be reused without, or with only very limited, refurbishment. Thermal analysis indicates that the nozzle design is acceptable when applied to a scaled-up 355-kg motor with a total burning time of 150 s. The all-carbon radiating nozzle design, fabrication, testing, and analysis activities are described. Author

N71-31112*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

MARINER MARS 1971 ORBITER PROPULSION SUBSYSTEM TYPE APPROVAL TEST PROGRAM

J. F. Stocky *In its* JPL Quart. Tech., Rev., Vol. 1, No. 2 Jul. 1971 p 47–53 (See N71-31106 18-30)

Copyright. Avail: NTIS CSCL 21H

A propulsion subsystem used on the Mariner Mars 1971 orbiter spacecraft to provide the necessary impulse for trajectory corrections, Mars orbit insertion, and Mars orbit trim maneuvers is subsystem The type approval test program that provided the functional, structural, and environmental qualification of this subsystem and demonstrated its performance margin in excess of flight mission requirements is described. Author

N71-31146*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

SATELLITE AUXILIARY PROPULSION SELECTION TECHNIQUES. SURVEY OF AUXILIARY ELECTRIC PROPULSION SYSTEM

Lee B. Holcomb 15 Jul. 1971 53 p refs

(Contract NAS7-100)

(NASA-CR-119319; JPL-TR-32-1505) Avail: NTIS CSCL 21C

A review of electric thrusters for satellite auxiliary propulsion was conducted. Comparisons of the various thrusters for attitude propulsion and east-west and north-south stationkeeping were made based upon performance, mass, power, and demonstrated life. Reliability and cost are also discussed. The method of electrical acceleration of propellant served to divide the thruster systems into two groups: electrostatic and electromagnetic. Ion and colloid thrusters fall within the electrostatically accelerated group while MPD and pulsed plasma thrusters comprise the electromagnetically accelerated group. Author

N71-31191*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE NASA QUIET ENGINE

James J. Kramer 1971 21 p refs Proposed for presentation at the 1971 Natl. Aeron. and Space Eng. and Manuf. Meeting, Los Angeles, 27 Sep.–1 Oct. 1971; Sponsored by the Soc. of Automotive Engr.

(NASA-TM-X-67884) Avail: NTIS CSCL 21E

The NASA Quiet Engine Program to incorporate all available noise reduction technology into a propulsion system suitable for subsonic civil transport aircraft is discussed. Full-scale experimental hardware is being built and tested primarily for noise performance. The program is in process and component tests to date indicate that it is possible to achieve or exceed noise reduction objectives of 15-20 perceived noise decibels below the levels of 707/DC-8 long-range transport aircraft. Author

N71-31214# Ohio State Univ. Research Foundation, Columbus.

AXIAL COMPRESSOR ROTOR DESIGN THROUGH SPECIFICATION OF THE MERIDIONAL VELOCITY PROFILE Final Report

Richard M. Hearsey Wright-Patterson AFB, Ohio ARL Feb. 1971 37 p refs

(Contract F33615-67-C-1758)

(AD-722824; ARL-71-0024) Avail: NTIS CSCL 10/1

A calculation scheme for the determination of conditions which follow an axial compressor rotor is described. The novel feature of the scheme is the specification of the meridional velocity profile rather than the energy input distribution. Numerical procedures to compute a solution are discussed and an example is given. Author (GRA)

N71-31248*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPARATIVE PERFORMANCE OF NUCLEAR AND CYROGENIC CHEMICAL SPACE PROPULSION SYSTEMS
Duane W. Dugan Washington Aug. 1971 17 p refs
(NASA-TM-X-2352) Avail: NTIS CSCL 21F

Solid core nuclear and cryogenic (LH2/LOX) propulsion systems are compared in a generalized way in order to locate boundaries of initial gross mass in Earth orbit and of payload mass that will define the region of performance superiority of one system over the other. The orbit from which both propulsion systems are considered to inject their respective payloads is assumed to be circular at an altitude of 150 nautical miles. The specific impulse of chemical stages is taken to be 456 seconds and that of the nuclear stages is assumed to have a nominal value of 825 seconds, a lower value of 800 seconds, and a high value of 850 seconds. Boundaries of equal performance are defined as a function of velocity increment for near Earth orbital maneuvers for which gravity losses are negligible, and as a function of hyperbolic excess speed for Earth escape missions in which gravity losses are taken into account. Both single stages of propulsion are considered. Boundaries are generally defined on the basis of sizing propulsion systems for each requirement of initial mass and velocity change, but the effects of fixing the stages at one size or another is also assessed. The use of a fixed size nuclear engine (thrust of 75,000 lbf and mass of 25,000 lbm) is included for comparison. Because the stage inert masses do not include mission dependent items such as meteoroid and thermal protection for propellant tanks, and cool down propellants in the case of the nuclear system, the boundaries obtained represent lower bounds. The effects of including additional radiation shielding in the nuclear stage for manned applications, however, are shown parametrically, as are the effects of a + or − 10 percent variation about the nominal inert masses of the nuclear system. Also investigated are the effects of specifying that the performance of the nuclear system be greater than that of the chemical system by given factors. Author

N71-31455*# Scientific Translation Service, Santa Barbara, Calif.
REQUIREMENTS OF ENGINE DYNAMICS IMPLIED BY THE THRUST MODULATION CONTROL FOR VTOL AIRCRAFT [ANFORDERUNGEN AN DIE TRIEBWERKSDYNAMIK BEDINGT DURCH DIE SCHBMODULATIONSSTEVERUNG BEI VTOL-FLUGZEUGEN]
H. G. Offenbeck Washington NASA Jul. 1971 9 p Transl. into ENGLISH from Proceedings of the WGLR Meeting on Air Breathing Eng. (Munich), Dec. 1969 p 231–238
(Contract NASw-2035)
(NASA-TT-F-13755) Avail: NTIS CSCL 21E

In the design of V/STOL high performaance aircraft, the choice of the engines and the control systems plays an important role for gliding and transition flight. For the control system, and the choice of engine for thrust modulation control, there are three dynamic criteria: stabilization for small disturbances; stabilization for engine failure; and control behavior. Author

N71-31456*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USE OF AN AIR-ASSIST FUEL NOZZLE TO REDUCE EXHAUST EMISSIONS FROM A GAS TURBINE COMBUSTOR AT SIMULATED IDLE CONDITIONS
Daniel Briehl and Leonidas Papathakos Washington 1971 21 p refs
(NASA-TN-D-6404; E-6247) Avail: NTIS CSCL 21E

Tests were performed at typical engine idle conditions on a single J-57 combustor liner installed in a 30-cm-(12-in.-) diameter pipe to evaluate design modifications for reducing exhaust emissions. Using an air-assist fuel nozzle, the combustion efficiency was increased from 90.3 to 96.5 percent, and the total hydrocarbon and carbon monoxide exhaust emissions were reduced from 26.3 to 3.3 and from 51 to 40 g/kg of fuel burned, respectively. A corresponding increase in nitric oxide emissions from 0.8 to 1.5 g/kg of fuel burned was observed. Calculations performed for a complete landing-takeoff cycle of a typical engine indicated that the use of an air-assist nozzle during idle could decrease the total quantity of hydrocarbon and carbon monoxide emission by 69 and 20 percent, respectively, while nitric oxide would increase by 14 percent. The required secondary nozzle airflow amounts to less than 0.5 percent of the total engine airflow at idle. Author

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N71-30406# Bern Univ. (Switzerland). Physikalisches Inst.
SIMULATION IN SPACE AND TIME OF THE NUCLEAR ACTIVE AND MUON COMPONENTS IN EXTENSIVE AIR SHOWERS FOR PRIMARY ENERGIES FROM 100000 TO 10 TO THE SEVENTH POWER GeV
P. K. F. Grieder 17 Nov. 1970 81 p refs Prepared in cooperation with Tokyo Univ.
(INSTJ-125) Avail: AEC Depository Libraries

Three highly detailed air shower models are described which imply different high energy multiplicity laws. The excitation of different isobar states and coproduction of one or two fireballs, depending on the type of model, are considered. The isobar component is the same for all models, but the fireball component is different in each case. Nucleon-antinucleon pair production is included in all models. Ionization losses are also considered for all charged particles, as well as coulomb scattering for muons. The simulation is carried out in three dimensions and time and is based exclusively on Monte Carlo calculations. The results of extensive calculations are summarized, and integral energy spectra and lateral density distributions for the different particles are compared with experimental data. Author

N71-30516# Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
GAMMA-RAY SPECTRA COMPUTER CODE, PART 1 [DEPOUILLEMENT AUTOMATIQUE DE SPECTRES GAMMA, 1 PARTIE]
Michel Delor Sep. 1970 46 p refs In FRENCH
(CEA-N-1381(1)-Pt-1) Avail: AEC Depository Libraries

A computer code for automatic analysis of complex gamma ray spectra from multichannel analyzer and a Ge(Li) detector is presented. The method enables the separation of close peaks: doublets, triplets, etc ... At the moment this program is limited to calculate the energies and the areas of the significant peaks. Author (NSA)

N71-30562*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRON ENERGY FLUX IN THE SOLAR WIND
K. W. Ogilvie, J. D. Scudder, and M. Sugiura Jul. 1971 27 p refs Submitted for publication
(NASA-TM-X-65621; X-692-71-264) Avail: NTIS CSCL 03B

Electrons were studied in the energy range 25 eV to 9.9 keV, from energies characteristic of the plasma electrons to energies just below those normally observed in solar electron events. The transport of energy in the rest frame of the plasma is evaluated and shown to be parallel to the interplanetary magnetic field. The presence of electrons from solar events causes this parallel energy flux density to exceed the parallel heat flow H due to thermal

electrons. In one such event, the observations are shown to be consistent with the solar electron observations made at higher energies. When observations are made at a point connected to the earth's bow shock by an interplanetary field line, a comparatively large energy flux along the field towards the sun is observed, but the parallel H remains outwardly directed during this time interval. In either case the parallel H is found to be consistent with measurements made on Vela satellites by a different method. These values, less than .01 ergs/sq cm sec, are sufficiently low to require modifications to the Spitzer-Harm conductivity formula for use in solar wind theories. Author

N71-30612*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LOW ENERGY METAGALACTIC COSMIC RAYS

R. Ramaty and L. A. Fisk Jul. 1971 12 p refs Submitted for publication

(NASA-TM-X-65623; X-660-71-291) Avail: NTIS CSCL 03B

The effects of an expanding universe with evolving sources on low energy cosmic rays are investigated mathematically. A metagalactic model of low energy cosmic rays is developed and discussed. J.M.

N71-30613*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EXPECTED ELECTRON AND PROTON ENVIRONMENT FOR THE COSMIC X-RAY EXPERIMENT ABOARD THE OSO-1 AND OSO-H SATELLITES

E. G. Stassinopoulos Jul. 1971 23 p

(NASA-TM-X-65624; X-641-71-293) Avail: NTIS CSCL 03B

A study was conducted to determine the ambient trapped particle fluxes encountered by the OSO-I, in order to evaluate the contamination of the cosmic X-ray detectors during times of apparently normal data acquisition in order to develop means for rejection of background events and/or provide a suitable normalization monitor. The study was expanded to provide data for the determination of possible radiation damage to COS/MOS devices on OSO, I and H. Orbital flux integrations for high energy electrons and protons were calculated using Vette' AE2 (electron) AP1, AP6, and AP7 current models. The spectral distribution of both types of particles are presented. Author

N71-30845*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EXPOSURE OF ATMOSPHERE EXPLORER SATELLITES TO VAN ALLEN BELT RADIATION. MISSIONS C, D, AND E

E. G. Stassinopoulos Jul. 1971 61 p Submitted for publication

(NASA-TM-X-65612; X-641-71-265) Avail: NTIS CSCL 03B

The anticipated particle flux densities were calculated for AE missions C, D, and E as a function of nominal orbit parameters. The proton and electron calculations are based on Vette models, and results are obtained for individual inclinations for each mission. The results are summarized in tables and graphs. F.O.S.

N71-30848*# Scientific Translation Service, Santa Barbara, Calif.

BACKGROUND RADIATION [O FONOVYKH IZLUCHENIYAKH]

O. F. Prilutskiy et al Washington NASA Jul. 1971 25 p refs Transl. into ENGLISH of Acad. of Sci. USSR, Inst. for Space Res., Moscow, report Pr-11

(Contract NASw-2035)

(NASA-TT-F-13732; Pr-11) Avail: NTIS CSCL 03B

Experimental data on isotropic background radiation (in radio- and X-ray energy bands, essentially) were obtained recently. It is assumed that these radiations are integral radiations of the Universe. Based on this assumption some of the cosmological parameters are obtained. Connections between isotropic radiations in radio- and X-ray energy bands are investigated. A model of the mean radiation source is proposed. It is also assumed that these sources are galaxies, similar to our Galaxy. Author

N71-30888*# National Aeronautics and Space Administration, Washington, D.C.

SOLAR ELECTROMAGNETIC RADIATION: SPACE VEHICLE DESIGN CRITERIA (ENVIRONMENT)

May 1971 36 p refs Revised

(NASA-SP-8005-Rev) Avail: NTIS CSCL 03B

New values are given for the solar constant and solar spectral irradiance for use in the design of space vehicles, spacecraft, subsystems, and experiments. High altitude observations with aircraft, balloons, and spacecraft have made possible improvement over the values given in previous reports which depended upon ground based observations. Author

N71-30896*# Stanford Univ., Calif. Radioscience Lab.

REDUCTION AND ANALYSIS OF TWO SETS OF ELECTRON CONTENT MEASUREMENTS PERMITTING THE INFERENCE OF ELECTRON DENSITY IN THE SOLAR WIND Final Report

T. A. Croft Jun. 1971 40 p refs

(Contract NAS2-4672)

(NASA-CR-114356) Avail: NTIS CSCL 03B

Measurements of the electron content from earth to several sun-orbiting and geostationary earth satellites were obtained by radio propagation means at various times in various sequences spread continuously over a period of 5.3 years. Through processing and analysis it is possible to infer the electron content of the solar wind along the radio path above the orbit of the geostationary craft, effectively removing the influence of the earth's ionosphere and magnetosphere from the derived result. Dividing the interplanetary content by the spacecraft distance yields the average free electron number density of the solar wind along the radio path. The density thus observed is of great potential scientific value, both in the study of short unusual events and in the derivation of long term statistical properties of the wind. Author

N71-30919*# Bell Telephone Labs., Inc., Murray Hill, N.J. Radiation Physics Research Dept.

REDUCTION AND ANALYSIS OF PARTICLE DATA FROM EXPLORER 15 AND EXPLORER 28 Final Report, Sep. 1962 - Aug. 1970

W. L. Brown 28 Feb. 1971 214 p refs Prepared for Western Elec. Co., Inc., New York

(Contract NAS5-3058)

(NASA-CR-119286) Avail: NTIS CSCL 03B

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A MAGNETIC STORM ON 18 APRIL 1965 W. L. Brown, L. J. Cahill (N. H. Univ.), L. R. Davis (NASA. Goddard Space Flight Center), C. E. McIlwain (Calif. Univ., La Jolla), and C. S. Roberts 9 p refs (See N71-30925 18-29)

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12. RADIAL DIFFUSION OF OUTER ZONE ELECTRONS: AN EMPIRICAL APPROACH TO THIRD INVARIANT VIOLATION L. J. Lanzerotti, C. G. Maclennan, and M. Schulz (Aerospace Corp., El Segundo, Calif.) 21 p refs (See N71-30931 18-29)

13. PARTICLE DETECTION EQUIPMENT AND PARTICLE DATA PROCESSING 4 p (See N71-30932 18-14)

N71-30921*# Bell Telephone Labs., Inc., Murray Hill, N.J.

SOME OBSERVATIONS OF THE DISTRIBUTION OF ENERGETIC PROTONS IN THE EARTH'S RADIATION BELTS BETWEEN 1962 AND 1964

J. D. Gabbe and W. L. Brown *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 20 p refs (See N71-30919 18-29)

Avail: NTIS CSCL 03B

Flux distributions for protons with energies between 4 and 13 MeV, 18 and 27 MeV, 26 and 33 MeV, 50 and 135 MeV, and 49 and 145 MeV measured from July 1962 to September 1963 at geocentric distances in the range 1.01 to 3.4 earth radii are presented. Using data extending to June 1964, secular temporal changes are discussed, some effects of the magnetic storm of 22 September 1963 are described, and some aspects of the energy spectrum are noted. Author

N71-30922*# Bell Telephone Labs., Inc., Murray Hill, N.J.

OBSERVATIONS OF THE TRANSIENT BEHAVIOR OF ELECTRONS IN THE ARTIFICIAL RADIATION BELTS

W. L. Brown *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 25 p refs (See N71-30919 18-29)

Avail: NTIS CSCL 03B

Observations of the artificial belts of energetic electrons and their transient decay following the U.S. and U.S.S.R. nuclear tests of 1962 are described and illustrate the sudden artificial alteration of the electron distribution. The observations were made by Telstar 1 and Explorer 15 which were advantageously in orbit at times of major activity during the testing period. In addition, some observations made by Relay 2 long after the creation of the artificial radiation belts are discussed. D.L.G.

N71-30923*# Bell Telephone Labs., Inc., Murray Hill, N.J.

ELECTRON LOSS FROM THE VAN ALLEN ZONES DUE TO PITCH ANGLE SCATTERING BY ELECTROMAGNETIC DISTURBANCES

Charles S. Roberts *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 21 p refs (See N71-30919 18-29)

Avail: NTIS

Experimental observations indicate that relativistic electrons in the Van Allen zones are perturbed by physical processes that violate one or more adiabatic invariants of the electron's motion. One such possible process is discussed, that of pitch angle or mirror point diffusion. A qualitative explanation of pitch angle diffusion and how this process can lead to loss of trapped particles is presented, and then a Fokker–Planck type diffusion equation is introduced to describe the process mathematically. This diffusion equation is used to treat the loss of electrons from trapped orbits due to pitch angle diffusion that results from cyclotron resonant scattering of electrons by whistlers. Predictions are compared with satellite data on the loss from the Van Allen zones of electrons artificially injected by a nuclear explosion. It is found that the data indicate that pitch angle diffusion does indeed play an important role in the loss process, but the dominant mechanism producing the pitch angle scattering must be something other than cyclotron resonant scattering by whistlers since this mechanism leads to several predictions that are in disagreement with the data. These include prediction of the electron pitch angle distribution, the variation of the pitch angle distribution with L-shell and energy, the variation of the loss rate with energy, and the magnitude of the loss rate. Author

N71-30924*# Bell Telephone Labs., Inc., Murray Hill, N.J.

CYCLOTRON AND BOUNCE RESONANCE SCATTERING OF ELECTRONS TRAPPED IN THE EARTH'S MAGNETIC FIELD

Charles S. Roberts *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 21 p refs (See N71-30919 18-29)

Avail: NTIS CSCL 03B

Two wave-particle interactions are examined which are likely to be important for producing pitch-angle scattering. These are cyclotron-resonance scattering by whistler-mode disturbances and bounce-resonance scattering by disturbances having electric- or magnetic-field components parallel to the earth's magnetic field. Both mechanisms can operate effectively not only with sinusoidally varying disturbance fields but also with irregular, noise-like field fluctuations. The latter have rather wide-band power-spectral-density functions, and the strength of the scattering is proportional to the power present at the frequency appropriate to produce either cyclotron or bounce resonance. Irregular whistler-mode disturbances with r.m.s. magnetic-field fluctuations of order 0.001 gamma or higher are significant in producing rates of pitch-angle diffusion in agreement with observed electron lifetimes in the slot and outer electron zone. If the whistler-mode power-spectral-density function decreases rapidly with increasing frequency, then this mechanism may have difficulty in explaining the pitch-angle scattering of nearly equatorially mirroring electrons. Contributions from bounce-resonance scattering can also be significant for the pitch-angle diffusion of relativistic electrons. The experimentally observed loss of radiation-zone electrons may actually be due to a combination of the two mechanisms, bounce resonance being more important for electrons mirroring near the magnetic equator and cyclotron resonance being dominant for electrons mirroring sufficiently far off the magnetic equator. Author

N71-30925*# Bell Telephone Labs., Inc., Murray Hill, N.J.

ACCELERATION OF TRAPPED PARTICLES DURING A MAGNETIC STORM ON 18 APRIL 1965

W. L. Brown, L. J. Cahill (N.H. Univ.), L. R. Davis (NASA. Goddard Space Flight Center), C. E. McIlwain (Calif. Univ., La Jolla), and C. S. Roberts *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 9 p refs (See N71-30919 18-29)

(Contract NASw-155; Grant NsG-538) NGR-05-009-007 Avail: NTIS CSCL 03B

A polar substorm-particle event is described which was observed with the magnetic field and trapped particle detectors on Explorer 26 during the worldwide magnetic storm of 17–18 April 1965. The event occurred between 0600 and 0830 UT on April 18 within the main phase of the magnetic storm. During this time the satellite was near apogee (L approximately equal to 5) and at a local time of 1300 hours. Nearly coincident with the polar substorm, the satellite records show that the local magnetic field decreased by about 40 gamma, while the proton flux (100–345 kev) increased by more than a factor of 10. About twenty minutes later the electron flux (10–1000 kev) started to increase. Both the field and particles show large fluctuations that are inversely correlated. Some of the possible explanations of the event and the limitations imposed by the observations are discussed. Author

N71-30926*# Bell Telephone Labs., Inc., Murray Hill, N.J.
COMPARISON OF THE ELECTRON RESPONSE IN THE MAGNETOSPHERE AT L EQUALS 5 WITH THE SOLAR WIND DURING THE 17–18 APRIL 1965 MAGNETIC STORM
L. J. Lanzerotti *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 4 p refs (See N71-30919 18-29)
Avail: NTIS CSCL 03B

Temporal comparisons are presented of the magnetosphere before and during the storm from data obtained by Explorer 26. The large electron flux changes that were observed during the storm at L equals 5 appear to have two separate features: (1) The rapid electron increase observed occurred near the onset of an intense polar substorm. This particle increase and magnetospheric activity began some 12 hours after the initial solar wind changes and the magnetic storm's sudden commencement caused by the interaction of the solar wind with the magnetosphere. These electrons observed during the initial flux increase appear to have been lost within about 4 hours. (2) The slower flux increase during the day of April 18 to the maximum on April 19 is typical of outer-belt electron increases during a magnetic storm. D.L.G.

N71-30927*# Bell Telephone Labs., Inc., Murray Hill, N.J.
OUTER ZONE ELECTRONS AND THE INTERPLANETARY MAGNETIC FIELDS DURING TWO GEOMAGNETIC STORMS
L. J. Lanzerotti *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 5 p refs (See N71-30919 18-29)
Avail: NTIS CSCL 03B

An examination is made of the connection between the interplanetary magnetic field data obtained from the first months of flight of Mariner 4 and the outer-zone electron flux changes during the Jan. 20 and Feb. 6 sudden commencement storms of 1965. A correlation between the magnitude of the southward interplanetary field component and the observed time of the nonadiabatic electron increases after the sudden commencement is discussed. In addition, evidence is presented of an apparent correlation between the persistence of the large southward component after the electron increases and the strength of the geomagnetic storm. D.L.G.

N71-30928*# Bell Telephone Labs., Inc., Murray Hill, N.J.
OUTER ZONE ELECTRON FLUXES DURING 5 FEBRUARY 1965 SOLAR PROTON EVENT
L. J. Lanzerotti *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 9 p refs (See N71-30919 18-29)
Avail: NTIS CSCL 03B

The solar wind plasma accompanying the solar proton event on 5 Feb. 1965, produced a sudden commencement magnetic storm observed on earth on 6 Feb. 1965. The effects of the magnetic storm on the low latitude outer belt electrons as observed by the Explorer 26 satellite are studied at L = 4.0, 4.5 and 5.0 R sub E. The time delay between the sudden commencement and the effects of the storm on the magnetosphere electrons is observed to be a function of both the electron L value and the electron energy. The storm is observed essentially simultaneously with the S.C. at L = 5.0 R sub E for E sub e > 0.3 MeV, while there is about a 30 hours time lag between the S.C. and the enhanced fluxes of electrons of E sub e > 1.0 MeV at L = 4.0 R sub E. The time behaviour of the electron fluxes is correlated with the magnetic field index, with the equatorial, and with the auroral electrojet index. The electron acceleration mechanism and the electron time correlations with other storm-induced effects are discussed in relationship to possible energy transfer mechanisms coupling the enhanced solar wind to the interior of the magnetosphere. Author

N71-30929*# Bell Telephone Labs., Inc., Murray Hill, N.J.
OBSERVATIONS OF TRAPPED ELECTRONS AT LOW AND HIGH ALTITUDES
D. J. Williams (NASA. Goddard Space Flight Center), J. F. Arens (NASA. Goddard Space Flight Center), and L. J. Lanzerotti *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 25 p refs (See N71-30919 18-29)
Avail: NTIS CSCL 03B

Energetic (greater than or equal to 280 kev, greater than or equal to 1 Mev) trapped electron intensities have been simultaneously obtained at low and high altitudes for a 6-month period in 1965 by the satellites 1963 38C and Explorer 26. The data show that the greater than or equal to 280-kev electron population attains equilibrium within a flux tube after a magnetic storm significantly faster than do the greater than or equal to 1-Mev electrons. Mechanisms leading to the equilibrium state are therefore less effective at the higher energies. An example of this is given in terms of pitch-angle scattering by whistle mode noise. The comparison of particle response characteristics at low and high altitudes during a main phase storm also is used to obtain a rough measure of field expansion in the storm. In addition energetic electrons associated with main phase magnetic storms are observed to appear initially at L values well within the trapping regions and subsequently diffuse to lower and higher altitudes. The region of appearance of these electrons is strongly correlated with magnetic storm-time variation magnitude. Preliminary results indicate that the acceleration mechanisms responsible for the appearance of these energetic electrons act on the high-altitude side of the whistler knee. The appearance of energetic electrons in the trapping regions from the equator to low altitudes during the 17 April 1965, storm also correlates very well spatially with an observed depletion of maximum ionospheric electron density. Author

N71-30930*# Bell Telephone Labs., Inc., Murray Hill, N.J.
DRIFT MIRROR INSTABILITY IN THE MAGNETOSPHERE: PARTICLE AND FIELD OSCILLATIONS AND ELECTRON HEATING
L. J. Lanzerotti, A. Hasegawa, and C. G. Maclennan *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 15 p refs (See N71-30919 18-29)
Avail: NTIS CSCL 03B

The published L = 5 equatorial magnetosphere particle and field data from the 18 April 1965 geomagnetic storm are reanalyzed in the context of a drift mirror instability theory. These data, together with previously unpublished electron pitch-angle data, are shown to satisfy the requirements and consequences of the instability. Additional particle data observed during a 1967 substorm by an experiment on ATS 1 are presented to show that the observation of the April 18 instability was not an isolated occurrence in the magnetosphere. The data also contain evidence for electron heating during the time of the instability. Author

N71-30931*# Bell Telephone Labs., Inc., Murray Hill, N.J.
RADIAL DIFFUSION OF OUTER ZONE ELECTRONS: AN EMPIRICAL APPROACH TO THIRD INVARIANT VIOLATION
L. J. Lanzerotti, C. G. Maclennan, and Michael Schulz (Aerospace Corp., El Segundo, Calif.) *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 21 p refs (See N71-30919 18-29)
(Contract F04701-69-C-0066)
Avail: NTIS CSCL 03B

The near-equatorial fluxes of outer-zone electrons (E > 0.5 Mev and E > 1.9 Mev) measured by an instrument on the satellite Explorer 15 following the geomagnetic storm of 17–18 December 1962, are used to determine the electron radial diffusion coefficients and electron lifetimes as functions of L for selected values of the conserved first invariant mu. For each value of mu, the diffusion coefficient is assumed to be time-independent. The diffusion coefficients and lifetimes are then simultaneously obtained by requiring that the L-dependent reciprocal electron lifetime, as determined from the Fokker-Planck equation, deviate minimally from a constant in time. Applied to the data, these few assumptions yield a value of D that is smaller by approximately a factor of 10 than the value recently found in a separate analysis of 1.6-Mev electron data obtained during the same time period on another satellite. The electron lifetimes are found to be strong functions of L, with 4- to 6-day lifetimes observed at the higher L values. Author

N71-30939# Scientific Group for Space Research, Athens (Greece).
DATA OF SOLAR-TERRESTRIAL INTEREST
D. J. Ilias and D. P. Elias, eds. Feb. 1971 18 p
Avail: NTIS

Routine solar observations are presented for three stations in Greece. Data reported include: short wave fadeouts, ionospheric absorption measurements, satellite, and sunspot observations. F.O.S.

N71-30942*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUNDAMENTALS OF RADIATION IN ABSORBING, EMITTING, AND SCATTERING MEDIA
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 1–35 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 04A

Fundamentals of absorption of radiation along a path in a medium, and emission by the medium are discussed. The important property of the radiation intensity is developed showing that along a path in a nonattenuating nonemitting medium the intensity is invariant with position. Thus the magnitudes of any attenuation or emission are expressed in terms of the changes produced in the intensity with distance. Author

N71-31042# Institut Royal Meteorologique de Belgique, Brussels.
QUALITATIVE AND QUANTITATIVE VARIATIONS IN SOLAR RADIATION COMPONENTS OVER HORIZONTAL SURFACE OF QUIET AIR AS FUNCTION OF ATMOSPHERIC TURBULENCE [VARIATIONS QUALITATIVES ET QUANTITATIVES DES COMPOSANTES DU RAYONNEMENT SOLAIRE SUR UNE SURFACE HORIZONTALE PAR CIEL SEREIN EN FONCTION DU TROUBLE ATMOSPHERIQUE]
R. Dogniaux 1970 26 p refs In FRENCH *Its* Publications Ser. B, No. 62
Avail: NTIS

The spectral distribution of energetic solar radiation in the atmosphere at normal angle of incidence is considered and atmospheric transmission factors for radiation extinction are developed. The spectral distribution of the energetic solar radiation in the atmosphere is based on the value of the solar equilibrium constant at 1.36 kW/sq m. Transl. by G.G.

N71-31088*# Translation Consultants, Ltd., Arlington, Va.
A MODEL OF THE INTERACTION BETWEEN THE SOLAR WIND AND AN INTERSTELLAR MEDIUM [MODEL' VZAIMODEYSTVIYA SOLNECHNOGO VETRA S MEZHZVEZDNOY SREDOY]
V. B. Baranov et al Washington NASA Nov 1970 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 194, no. 1, 1970 p 41–44
(Contract NASw-2038)
(NASA-TT-F-13820) Avail: NTIS CSCL 04A

A model of the interaction between the solar wind and an interstellar medium, based on the assumption that Coulomb collisions predominate in interstellar gas, is designed and described. Hydrodynamic equations are used to describe the flow. Author

N71-31089*# Scripta Technica, Inc., Washington, D.C.
ROTATIONAL DISCONTINUITIES IN THE SOLAR WIND [VRASHCHATELNYYE RAZRYVY V SOLNECHNOM VETRE]
K. G. Ivanov NASA Sep. 1970 8 p refs Transl. into ENGLISH of Akad. Nauk SSSR, Inst. Zemnogo Magnetizma, Ionosfery i Rasprostraneniya Radiovoln, Moscow, report
(Contract NASw-2036)
(NASA-TT-F-13811) Avail: NTIS CSCL 03B

On the basis of the simplest closed system of hydrodynamic equations, a study is made of the conditions at rotational discontinuities in a plasma with anisotropic pressure. It is found that at anisotropic rotational discontinuities, in contrast to isotropic discontinuities, jumpwise changes in the modulus of the magnetic field H vector are possible, and the tangential components H sub t vector at the front are always collinear. By analysis of simultaneous plasma and magnetic data it is shown that 10 out of 11 of the large velocity discontinuities that were observed in the Explorer-34 in 1967 must be attributed to discontinuities of the rotational, and not of the tangential type, since the condition specific to rotational discontinuities, is satisfied at them, linking the jumps of the tangential components of the flux velocity of the solar wind and the interplanetary magnetic field. Author

N71-31195*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUIET-TIME ELECTRON INCREASES, A MEASURE OF CONDITIONS IN THE OUTER SOLAR SYSTEM
L. A. Fisk and M. Van Hollebeke Jul. 1971 50 p refs Submitted for publication
(NASA-TM-X-65625; X-660-71-294) Avail: NTIS CSCL 03B

It is suggested that quiet-time increases may occur when more electrons than normal penetrate a modulating region that lies far beyond the orbit of earth. The number of electrons penetrating this region may increase when field lines that have experienced an unusually large random walk in the photosphere are carried by the solar wind out to the region. As evidence for this increased random walk, it is shown that for fine solar rotations before most of the quiet-time increases, there is an extended period when the amplitude of the diurnal anisotropy, as is measured by the Deep River neutron monitor, is relatively low. Five rotations delay time implies that the proposed modulating region lies at approximately 30 AU from the Sun, assuming that the average solar wind speed is constant over this distance at approximately 400 km/sec. The implications for the correlation between periods of low amplitude diurnal anisotropy and quiet-time increases on interplanetary conditions out to approximately 30 AU, and some possible models for the proposed modulating region are also considered. Author

N71-31220# Wisconsin Univ., Madison.
QUALITATIVE AND QUANTITATIVE FEATURES OF THE TERRESTRIAL SOLAR ULTRAVIOLET RADIATION ENVIRONMENT
Edwin Charles McCullough (Ph.D. Thesis) 1971 129 p refs
(Contract AT(11-1)-1105; Grant CA-05104)
(COO-1105-164) Avail: NTIS

The various geometrical, astronomical and atmospheric factors which influence terrestrial solar uv are reviewed. A uv dosimeter whose spectral sensitivity approximates the erythemal (sunburn) response of human skin would provide a measure of the erythemal effectiveness of the uv radiation present at the time of measurement. Three photosensitive glasses were investigated as erythemally effective uv dosimeters. Thermoluminescent (TL) phosphors are small in size which makes them especially suited for in-vivo studies and personnel dosimetry. In addition, they require no electronics at the site of measurement and operate unattended. Investigations on the use of transferred TL in natural calcium fluoride (CaF2:nat) as a uv dosimeter were carried out under both daylight and artificial illumination. The spectral sensitivity of transferred TL was found to be such that if the CaF2:nat phosphor is used in a subtraction mode using a sharp cutoff filter, the dosimeter spectral sensitivity is similar to the erythema action spectrum of untanned human skin. Author (NSA)

N71-31308#* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERNAL STRUCTURE OF THE GEOMAGNETIC NEUTRAL SHEET
Karl Schindler (ESRIN) and Norman F. Ness [1971] 29 p refs Submitted for publication
(NASA-TM-X-67153) Avail: NTIS

A study of the internal structure of the neutral sheet in the geomagnetic tail has been made from data obtained by the NASA-GSFC magnetic field experiment on the Explorer 34 spacecraft during its tail passage in the first half of 1968. The data used in the analysis are individual measurements of the vector magnetic field at 2.56 sec intervals. The experimental results consist of statistical studies of field orientation and the z sub sm component as a function of field magnitude. The results do not support nearly one dimensional field models with characteristic lengths for field variation parallel to the neutral sheet much larger than the neutral sheet width. The principal conclusion from the data points toward consistency with a quasiperiodic (possibly turbulent) structure with a tendency to formation of magnetic loops as one might expect from stability studies. Numerical results obtained using a simple model with a periodic field pattern in the field reversal region are compared with the observed internal structure. Author (ESRO)

N71-31460# International Geophysical Year World Data Center A, Boulder, Colo.
CATALOGUE OF DATA ON SOLAR-TERRESTRIAL PHYSICS IN WORLD DATA CENTER A SUBCENTERS
Jul. 1971 269 p refs Supercedes <UAG-11<
(UAG-15; UAG-11) Avail: SOD $1.50

The holdings in three solar-terrestrial physics disciplines at World Data Center A subcenters including upper atmosphere geophysics, Boulder, Colorado; rockets and satellites, Greenbelt, Maryland; and geomagnetism, Boulder, Colorado are cataloged. A master station list and tables with the locations of information on solar and interplanetary phenomena, ionospheric phenomena, flare-associated events, geomagnetic phenomena, auroras, cosmic rays, airglow, and miscellany are included. J.M.

N71-31468 National Environmental Satellite Center, Washington, D.C.
TABLE OF SCATTERING FUNCTION OF INFRARED RADIATION FOR WATER CLOUDS
Giichi Yamamoto, Masayuki Tanaka, and Shoji Asano Apr. 1971 90 p refs
(NOAA-TR-NESS-57) Avail: SOD $1.00

The scattering of infrared radiation by water clouds was calculated from the Mie theory. Tables are presented for the phase function and the degree of polarization for each degree of scattering angle; the volume cross sections for extinction, scattering, and absorption; and the albedo for single scattering. Three models are used, representing altostratus, nimbostratus, and stratocumulus clouds. Author

N71-31517# Institut Royal Meteorologique de Belgique, Brussels.
STATISTICAL STUDY OF RELATIONS BETWEEN GLOBAL SOLAR RADIATION COMPONENTS FROM RADIOMETRIC OBSERVATIONS, 1951-1965 [ETUDE STATISTIQUE DES RELATIONS ENTRE LES COMPOSANTES DU RAYONNEMENT SOLAIRE GLOBAL A PARTIR D'OBSERVATIONS RADIOMETRIQUES]
R. Dogniaux and P. Doyen 1969 34 p refs In FRENCH; ENGLISH summary *Its* Publ. Ser. A, No. 68
Avail: NTIS

For minimal and optimal atmospheric turbidity conditions, an analytical link between the global solar radiation components, on the one hand, and the parameters making allowance for their hourly variation (sun's altitude) and their seasonal variation (sun's declination), on the other hand is established. The proposed analytical relations are applied to the computation of the irradiances and the irradiations of the solar radiation components, parameters which are peculiar to the radiation climate of Belgium. Author

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N71-30479# Joint Inst. for Nuclear Research, Dubna (USSR). Lab of Nuclear Problems.
HEAVY LEPTON AND NEUTRINO ASTRONOMY
B. Pontecorvo 1971 7 p refs
(JINR-E2-5587) Avail: AEC Depository Libraries

It is shown that hypothetical existence of heavy leptons can be of importance in neutrino astrophysics. Author (NSA)

N71-30511*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TBERR: TWO-BODY ERROR ANALYSIS PROGRAM
Daniel P. Muhonen May 1971 48 p ref
(NASA-TM-X-65620; X-551-71-238) Avail: NTIS CSCL 22A

The Two-body error analysis program is a rapid computer program designed to evaluate the resulting state vector and covariance matrix for an orbiter after one coast and one burn maneuver. After the burn, histograms are computed for the orbital elements and other state dependent variables, including delta-velocity corrections necessary to attain a prescribed orbit. The program is coded in FORTRAN 4 for the IBM 360/95 computer. A user's guide and a complete description of the analysis are submitted. Author

N71-30512*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGETIC ELECTRONS FROM THE ACTIVE REGION MACMATH NO. 9808 DURING 20 JULY AND 5 AUGUST 1967
Kunitomo Sakurai Jul. 1971 20 p refs

(NASA-TM-X-65813; X-693-71-268) Avail: NTIS CSCL 03B

The active region MacMath no. 8905 produced 16 distinct electron events associated with solar flares during its passage across the solar disk from 21 July to 4 August 1967. An increase of the background flux of energetic electrons was also observed in association with the passage of this active region during this period. Based on the analysis of the characteristics of this active region, it is shown that these electrons were continuously accelerated in and ejected from this active region. Distinct electron events seem to have been produced as a result of the sudden release of excess energetic electrons due to the variation of the state of the active region by solar flares. Author

N71-30513*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GODDARD ASTRONOMIC AND GEODYNAMIC PARAMETERS

Joseph W. Siry Nov. 1970 36 p refs

(NASA-TM-X-65607; X-550-70-481) Avail: NTIS CSCL 03A

A reference set of astronomic and geodynamic parameters to be employed at the Goddard Space Flight Center is presented. The set includes fundamental astronomical constants, gravitational harmonic coefficients, station locations and other geometric quantities. It reflects results of recent research based upon data gathered by means of near-earth satellites and lunar and planetary spacecraft. It is consistent in this context with the IAU System of Astronomical Constants and values given in the Explanatory Supplement to the American Ephemeris and Nautical Almanac. Additional astrodynamic parameters of interest, including those used for manned flight computations, are also presented. Author

N71-30594# European Space Research Organization, Paris (France).

PLANETARY SPACE MISSIONS. VOL 4: THE PHYSICS OF PLANETARY SURFACES [MISSIONS SPATIALES VERS LES PLANETES. VOL 4: PHYSIQUE DES SURFACES PLANETAIRES]

Nov. 1970 47 p In FRENCH; ENGLISH summary Proc. of the 7th ESRO Summer School, Interlaken, Switz., 1969

(ESRO-SP-56) Avail: NTIS

CONTENTS:

1. PLANETARY STUDY: OBSERVATIONS USING OPTICAL METHODS A. Dollfus (Paris Obs.) p 1-20 (See N71-30595 18-30)

2. LUNAR SURFACE A. Dollfus (Paris Obs.) p 21-39 (See N71-30596 18-30)

N71-30595# Paris Observatory, Meudon (France).

STUDY OF PLANETS: GROUND OBSERVATIONS USING OPTICAL METHODS [ETUDE DES PLANETES: OBSERVATIONS AU SOL PAR LES PROCEDES OPTIQUES]

Audouin Dollfus *In* ESRO Planetary Space Missions. Vol. 4: The Phys. of Planetary Surfaces Nov. 1970 p 1-20 In FRENCH (See N71-30594 18-30)

Avail: NTIS

Certain aspects of the physics of planetary surfaces are studied and ground-based observation techniques are discussed. It is shown how, in the case of the Moon, photometric analyses and particularly polarimetric analyses have enabled predictions to be made as to the nature, composition, and state of the lunar surface, subsequently borne out by direct explorations during the Apollo missions. The results obtained by these methods therefore justify their having been extended to the study of other members of the solar system, in particular to the study of the planets Mercury and Mars. Author (ESRO)

N71-30596# Paris Observatory, Meudon (France).

THE LUNAR SURFACE [LA SURFACE DE LA LUNE]

Audouin Dollfus *In* ESRO Planetary Space Missions. Vol. 4: The Phys. of Planetary Surfaces Nov. 1970 p 21-39 In FRENCH (See N71-30594 18-30)

Avail: NTIS

Some 15 photographs of the Moon, taken from the Earth or brought back by circumlunar space probes, are interpreted. On the basis of the examples afforded by these photographs the main theories are discussed which endeavour to account for the Moon's surface features. While the craters do not seem to pose serious problems (their origin being due to impacts brought about either by former Earth satellites, or by asteroids, meteorites and comets), the maria on the other hand (which consist for the most part of outflows of basalt) are much more open to question. The origin of the heat which has led to the melting and then to the outflow of this lunar basalt has given rise to rival theories, each based on sound arguments. Author (ESRO)

N71-30631# European Space Vehicle Launcher Development Organization, Paris (France).

EVALUATION OF THE ERROR MATRIX IN THE RECONSTRUCTION OF THE INJECTION POINT BASED ON ORBITAL MEASUREMENTS FROM THE GROUND [EVALUATION DE LA MATRICE D'ERREUR DANS LA RECONSTRUCTION DU POINT D'INJECTION A PARTIR D'OBSERVATIONS ORBITALES TERRESTRES]

E. Cambi May 1971 32 p refs In FRENCH

(ELDO-TM-127) Avail: NTIS

The formulas are given which state explicitly, in terms of the state vector at the moment of measurement, the matrix A appearing in the relationship C sub 1 = A sup T C sub 0 A sub 1 which expresses the covariance matrix of the errors at the end of the extrapolation (C sub 1) in terms of the same matrix at the start (C sub 0). Author (ESRO)

N71-30661*# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

TRAFFICABILITY AND VISIBILITY ANALYSIS OF THE LUNAR SURFACE

H. T. McAdams, P. A. Reese, and G. M. Lewandowski Washington NASA Jul. 1971 83 p refs

(Contract NAS8-26251)

(NASA-CR-1881) Avail: NTIS CSCL 03B

for the continuous flux, which is comparable (although somewhat lower) with other upper limit of 30N/sq. cm. is established for a 1N importance optical flare. Also the omnidirectional intensity of atmospheric gamma rays, converted in the Aluminum sheath, has been measured at ballon altitudes at three energy levels. A value of 0.33/sq. cm. sec has been found for energies greater than 20MeV. The results are in good agreement with those obtained by Fichtel et al.(1969). Author (GRA)

N71-30678*# Boeing Co., Seattle, Wash. Research and Engineering Div.

CHEBYCHEV TRAJECTORY OPTIMIZATION PROGRAM (CHEBYTOP 2) Final Report

D. W. Hahn and F. T. Johnson Jun. 1971 150 p refs

(Contract NAS2-5994)

(NASA-CR-114354; D180-12916-1) Avail: NTIS CSCL 22C

The CHEBYTOP 2 program is an analysis tool that enables the user to conduct rapidly the parametric analysis and optimization of interplanetary missions employing electrically propelled spacecraft. The analytical and numerical algorithm used is termed the Chebyschev optimization method. The method avoids numerical integration and the usual variational calculus solution by employing polynomial representation and several other specialized techniques. The program is specialized to solve the interplanetary trajectories, with the planets themselves assumed massless. Planetary positions and velocities are computed from stored orbital elements. The elements of the nine major planets are available, plus 8 additional

Computerized methods for trafficability and visibility analysis were developed for use in lunar surface mission planning, using either manned or unmanned roving vehicles. The Fra Mauro area was selected as the site to be analyzed using these techniques, since the Apollo 14 mission scheduled to land in this area could help to verify many assumptions developed during this study regarding the lunar surface roughness characteristics as seen during surface operations. Trafficability and visibility maps were successfully produced based on the available data for the site. Author

N71-30728# Defense Documentation Center, Alexandria, Va.
RENDEZVOUS TRAJECTORIES, VOLUME 1 Report Bibliography, Oct. 1959–Sep. 1969
Apr. 1971 95 p refs
(AD-722890; DDC-TAS-70-85-1-Vol-1) Avail: NTIS CSCL 22/3

The compilation of annotated references on Rendezvous Trajectories, rendezvous guidance or terminal technique pertains to steering and control of space flight, intercept, orbital trajectories, ascent trajectories, man-machine systems, docking, and maneuverability. Corporate author-monitoring agency, subject, title, and personal author indexes are included. Author (GRA)

N71-30748*# Techtran Corp., Glen Burnie, Md.
MORPHOLOGICAL MATURITY OF SMALL LUNAR CRATERS AS A FUNCTION OF THEIR AGE AND DIMENSIONS [MORFOLOGICHESKAYA ZRELOSTI MELKIKH LUNNYKH KRATEROV KAK FUNKSTIYA IKH VOZRASTA I RAZERMOV]
K. P. Florenskiy et al Washington NASA Jul. 1971 15 p refs Transl. into ENGLISH of Acad. of Sci. USSR, Inst. for Space Res., Moscow, report Rept-45
(Contract NASw-2037)
(NASA-TT-F-13739; Rept-45) Avail: NTIS CSCL 03B

Craters were divided into 5 classes: A, very sharp and fresh; AB, rather sharp; B, somewhat softened; BC, quiet shallow and blurry; and C, very shallow and soft. Large scale Lunar Oribter photos of mare regions were investigated to find overlapping and intersecting craters, whose diameters were between 60 m and 2500 m. It was found that between craters of the same diameters, more soft and matured craters were more ancient then fresh ones. Between craters of the same morphological maturity larger ones were more ancient. These relations are illustrated in the scheme, which reflects semiquantatively the correlations between time of crater existence (as a whole and in A, AB, B, BC, C class states) and crater sizes. Author

N71-30788# Joint Publications Research Service, Washington, D.C.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 254
15 Jun. 1971 70 p refs Transl. into ENGLISH from various Sino-Soviet bloc publications
(JPRS-53367) Avail: NTIS

CONTENTS:

1. ASTRONOMY p 1–4 (See N71-30789 18-30)
2. METEOROLOGY p 5–15 refs (See N71-30790 18-20)
3. OCEANOGRAPHY p 16–27 (See N71-30791 18-13)
4. TERRESTRIAL GEOPHYSICS p 28–37 refs (See N71-30792 18-13)
5. UPPER ATMOSPHERE AND SPACE RESEARCH p 38–52 (See N71-30793 18-13)
6. FLIGHTS TO GIANT PLANETS OF THE SOLAR SYSTEM SUPPLEMENT p 54–65 ref (See N71-30794 18-30)

N71-30789# Joint Publications Research Service, Washington, D.C.
ASTRONOMY
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 254 15 Jun. 1971 p 1–4 (See N71-30788 18-30)
Avail: NTIS

A state of the art review of X-ray astronomy is presented, including historical data, registering methods of X-radiation, discrete sources of cosmic X-radiation, and isotropic X-radiation. Characteristics of lunar rock samples are briefly considered. The completion of the Zelenchukskaya Observatory is announced. Numerical modeling of circulation in the Venusian atmosphere is briefly described, using full equations of hydrodynamics. J.A.M.

N71-30794# Joint Publications Research Service, Washington, D.C.
FLIGHTS TO GIANT PLANETS OF THE SOLAR SYSTEM Supplement
In its Soviet Bloc Res. in Geophys., Astronomy, and Space, No. 254 15 Jun. 1971 p 54–65 ref (See N71-30788 18-30)
Avail: NTIS

A Soviet news release on space flight to other planets in this solar system is reported, emphasizing the grand tour program. Minimum rate of acceleration from orbit of an artificial earth satellite, flight time, and power consumption are presented in tabular form. J.A.M.

N71-30843*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
PLASMON NEUTRINOS EMISSION IN A STRONG MAGNETIC FIELD. PART 2: LONGITUDINAL PLASMONS
V. Canuto, C. Chiuderi (Florence Univ.), and C. K. Chou 1970 17 p refs Submitted for publication Sponsored in part by NAS-NRC and ESRO
(Grant NGR-33-008-012)
(NASA-TM-X-67239) Avail: NTIS CSCL 20H

The decay of a longitudinal plasmon into two neutrinos is studied in the presence of a strong magnetic field. Contrary to the transverse case, for longitudinal plasmons the existence of a new mode, entirely dependent on the magnetic field, greatly enhances the energy loss at high densities. Denoting by Q sub H and Q sub 0 the neutrino energy losses with and without magnetic field respectively, the situation is as follows: at H approximately = to 10 to the 11th power gauss and T > or = 10 to the 9th power K, Q sub 0 >> 100,000 Q sub H for rho < 10 to the 11th power g/cu cm, while Q sub H >> 10 to the 10th power Q sub 0 for rho > 10 to the 11th power g/cu cm. A second physically interesting feature is the anisotropic character of the energy loss which is highly peaked along the field lines, giving rise to a shorter cooling time in that direction than in any other. Author

N71-30891# Milan Univ. (Italy). Istituto di Scienze Fisiche.
ALBEDO NEUTRON COMPONENT OF THE EARTH'S RADIATION ENVIRONMENT Final Scientific Report, 1 May 1968–30 Apr. 1970
Giuseppe P. S. Occhialini 23 Dec. 1970 22 p refs
(Contract F61052-68-C-0050)
(AD-722467; AFCRL-71-0133) Avail: NTIS CSCL 3/2

A high energy neutron detector has been constructed to measure the solar neutron flux, under quiet or active Sun conditions, over the energy range 10 MeV to 200 MeV. The detector consists of a plastic scintillator (the central detector) with anticoincidence shield. The central detector is surrounded by an Aluminum sheath, whose purpose is to bring to rest the recoil protons, thus diminishing the self-gating effects and keeping the detection efficiency high enough at high energies. No finite flux has been however detected and an upper limit of 0.0055N/sq. cm. has been established

sets of elements. Either rendezvous (matching the planet's orbital velocity about the sun), flyby (matching only the planet's position at the terminal time) or excess velocity trajectories may be obtained. Excess velocity trajectories are those which arrive or depart from a massless planet with a specified velocity relative to the planet. The program, at the user's option, determines optimum departure or arrival dates between planets and optimum in-plane travel angles between orbits or between planets or orbits. Author

N71-30908* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SPACE FLIGHT HANDBOOKS. VOLUME 3: PLANETARY FLIGHT HANDBOOK. PART 7: DIRECT TRAJECTORIES TO JUPITER, SATURN, URANUS, AND NEPTUNE. SUPPLEMENT A: TABULAR TRAJECTORY FOR DIRECT TRAJECTORIES OF JUPITER AND SATURN

[1971] 395 p

(NASA-TM-X-67252) Avail: NASA. Ames Res. Center, Moffett Field, Calif. 94035 CSCL 22C

The data for direct trajectories to Jupiter and Saturn are presented chronologically and are organized by holding the arrival date constant while varying the Earth departure data in increments of 10 days. Upon completion of the specified range of Earth departure dates, the arrival date is incremented and the range of departure dates is repeated. The range of departure and arrival dates and their corresponding increments are given for each launch opportunity. Author

N71-30909* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SPACE FLIGHT HANDBOOKS. VOLUME 3: PLANETARY FLIGHT HANDBOOK. PART 7: DIRECT TRAJECTORIES TO JUPITER, SATURN, URANUS, AND NEPTUNE. SUPPLEMENT B: TABULAR TRAJECTORY DATA FOR DIRECT TRAJECTORIES TO URANUS AND NEPTUNE

[1971] 270 p

(NASA-TM-X-67187) Avail: NASA. Ames Res. Center, Moffett Field Calif. 94035

The data for direct trajectories to Uranus and Neptune are presented chronologically and are organized by holding the arrival date constant while varying the Earth departure date increments of 10 days. Upon completion of the specified range of Earth departure dates, the arrival date is incremented and the range of departure dates is repeated. The range of departure and arrival dates and their corresponding increments are given for each launch opportunity. Author

N71-30920*# Bell Telephone Lab., Inc., Murray Hill, N.J.

STUDIES OF TRAPPED RADIATION BY THE TELSTAR 1 AND EXPLORER 15 SATELLITES

W. L. Brown *In its* Reduction and Analysis of Particle Data from Explorer 15 and Explorer 26 28 Feb. 1971 21 p refs (See N71-30919 18-29)

Avail: NTIS CSCL 03B

The experimental results from the Telstar 1 and Explorer 15 satellites are examined and the consequences of the special plasmas created by nuclear explosions in space are dealt with. Telstar 1 observations began almost immediately after the United States high altitude nuclear explosion of 9 July 1962, and Explorer 15 was launched just before the second of the three Russian high altitude nuclear tests that took place in Oct. and Nov. of 1962. Both electron and proton flux contours are presented which illustrate the particle distribution during these events. It is concluded that there is evidence that for both protons and electrons in the trapped particle region around the earth, plasmas are important in mechanisms of injection, acceleration, and particle loss. These plasmas are the low temperature plasma around the magnetosphere, the high temperature plasma arriving from the sun and the man-made plasma of nuclear explosions. D.L.G.

N71-30953*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

APOLLO 14 PRELIMINARY SCIENCE REPORT

Washington 1971 313 p refs

(NASA-SP-272) Avail: SOD $3.00; NTIS CSCL 22A

Preliminary reports are presented on Apollo 14 scientific experiments on lunar geology, atmosphere, photography, and astronomy. For individual titles, see N71-30954 through N71-30979.

N71-30954*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

SUMMARY OF SCIENTIFIC RESULTS

Philip K. Chapman, Anthony J. Calio, and M. Gene Simmons *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 1–8 (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

Preliminary results from the Apollo 14 mission including the geology of Fra Mauro, lunar soil and rock samples, and soil mechanics are presented. Passive and active seismometry, suprathermal ion detector, cold-cathode gage, charged-particle lunar environment, laser ranging retroreflector, solar wind composition, lunar portable magnetometer, S-band transponder, and ancillary experiments are cited. Composite casting, electrophoretic separation, heat flow and convection, and liquid transfer analyses results are also given for the samples used by the crew for demonstrations during the transearth coast. J.M.

N71-30955*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PHOTOGRAPHIC SUMMARY

John W. Dietrich *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 9–32 (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

A brief summary of Apollo 14 mission photography is presented including cameras and films used in the command lunar modules and during EVA. The sequence of photographic activity during the mission is outlined. Representative mission photographs taken between the time of docking during translunar coast and transearth coast are shown. J.M.

N71-30956*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

CREW OBSERVATIONS

Alan B. Shepard, Edgar D. Mitchell, and Stuart A. Roosa *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 33–37 (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

A summary of the scientific observations of the Apollo 14 crew is presented. Included are comments on the appearance of the earth and moon during cislunar flight and lunar orbit, observations from the surface of lunar terrain features, descriptions of crew mobility in the lunar environment, and geological and soil-mechanics observations made during the two extravehicular activity periods. Author

N71-30957*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PRELIMINARY GEOLOGIC INVESTIGATIONS OF THE APOLLO 14 LANDING SITE

G. A. Swann (Geol. Surv.), N. G. Bailey (Geol. Surv.), R. M. Batson (Geol. Surv), R. E. Eggleton (Geol. Surv.), M. H. Hait (Geol. Surv.) et al *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 39–85 refs (See N71-30953 18-30)

(NASA Order T-6523G) Avail: SOD $3.00; NRIS CSCL 22A

The geology of the Fra Mauro landing site including regional and local geologic settings is presented. Detailed analysis of surface photographs of boulders ejected from Cone Crater and comparison of these photographs with returned samples indicate that the Fra Mauro Formation is mainly composed of moderately

coherent breccias in which dark lithic clasts up to 50 cm or more across and less abundant light clasts are set in a light matrix. Subordinate rock types that may be part of the Fra Mauro Formation include coherent breccias with about equal amounts of light and dark clasts and breccias with irregular bands of very light clastic rock. Optical properties of surface materials, lineaments, fillets, and boulders are discussed. Lunar sample locations and documentations are tabulated. Author

N71-30958*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

SOIL MECHANICS EXPERIMENT

J. K. Mitchell (Calif. Univ., Berkeley), L. G. Bromwell (MIT), W. D. Carrier, III, and N. C. Costes (NASA. Marshall Space Flight Center), and R. F. Scott (Calif. Inst. of Tech.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 87–108 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

The effects of the Apollo 14 lunar module descent and landing on the lunar surface soil at the Fra Mauro site are described. Observations of the surface soil behavior during extravehicular activities are summarized including soil adhesive and cohesive characteristics. An evaluation of lunar soil mechanical properties is given from the modularized equipment transporter track data along with a description of the penetrometer. The soil mechanics trench excavated at station G is also discussed. Preliminary analysis of in situ particle size versus frequency distribution is included along with the general characteristics and grain size distributions of the lunar core tube samples. J.M.

N71-30959*# National Aeronautics and Space Distribution. Manned Spacecraft Center, Houston, Tex.

PRELIMINARY EXAMINATION OF LUNAR SAMPLES

In its Apollo 14 Prelim. Sci. Rept. 1971 p 109–131 refs Prepared by the Lunar Sample Prelim. Exam. Team (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

The major findings of the preliminary examination of the lunar samples returned from the Apollo 14 Fra Mauro site are presented. The mineralogy and petrology of the samples are outlined for fragmental and homogeneous crystalline rocks. Shock metamorphism, rock surface features, and soil and core tube samples are discussed. Results of the emission spectrographic analysis including elemental and mineral abundances are cited. Concentrations of long-lived radioactive elements and carbon contents of the samples are enumerated. Induced radioactivities, determination of rock orientations from solar-flare data, noble gas contents, and the biological findings are also given. J.M.

N71-30960*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

PASSIVE SEISMIC EXPERIMENT

Gary V. Latham (Lamont-Doherty Geol. Obs.), Maurice Ewing (Lamong-Doherty Geol. Obs.), Frank Press (MIT), George Sutton (Hawaii Univ.), James Dorman (Lamont-Doherty Geol. Obs.) et al *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 133–161 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

An evaluation of seismic signals from the passive seismic experiment of the Apollo 14 mission are summarized. A description of the instrumentation and performance is presented. Signals from moonquakes and meteoroid events are discussed as well as those from preascent events and impacts from the Saturn S-4B and lunar module ascent stages. Data from the long period and short period vertical seismometers are evaluated. Natural events recorded from each station are covered in detail. Discussions of seismic-wave propagation and lunar structure, location and focal mechanism of moonquakes, meteoroid flux, radius of detectability for impacts, and correlation between seismic events and measurements of natural and ionized gas are included. J.M.

N71-30961*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

ACTIVE SEISMIC EXPERIMENT

Robert L. Kovach (Stanford Univ.), Joel S. Watkins (N. C. Univ.), and Tom Landers (Stanford Univ.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 163–174 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

The Apollo 14 active seismic experiment to generate and monitor seismic waves in the lunar near surface for use in the study of the internal structure of the moon to a depth of approximately 460 m is outlined. Two seismic energy sources were used; and astronaut-activated thumper device containing 21 small explosive initiators and a mortar package containing four high-explosive grenades. The experiment also monitors high-frequency seismic activity during periodic listening modes. The instruments and their performance are described including thermal control and deployment. The recorded seismic signals during thumper and passive listening modes are summarized. Two compressional wave (P-wave) seismic velocities were measured at the Fra Mauro site. The near-surface material possesses a velocity of 104 m/sec and underlying the superficial layer at a depth of 8.5 m, the lunar material has a velocity of 299 m/sec. J.M.

N71-30962*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

SUPRATHERMAL ION DETECTOR EXPERIMENTS (LUNAR IONOSPHERE DETECTOR)

H. K. Hills (Rice Univ.) and J. W. Freeman, Jr (Rice Univ.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 175–183 refs Supported in part by ESRO Prepared in part by time Zero Corp. (See N71-30953 18-30)

(Contract NAS9-5911)

Avail: SOD $3.00; NTIS CSCL 22A

Performance of the suprathermal ion detector (SIDE) yielded the following observations: Ions of 250-to 1000eV energy were observed streaming down the magneto-sheath toward the tail as the Moon entered the magnetospheric tail of the Earth. Intermittent intense fluxes of 50- to 70-eV ions were observed about 2 days after sunrise, with masses indicated to be in the 17- to 24-amu/q range. Energy and mass spectra were observed during the venting of the oxygen atmosphere in the LM cabin. A large ion cloud was observed to pass over both the Apollo 14 and 12 sites during a relatively large seismic disturbance. The ascent flight of the Apollo 14 LM was observed by the SIDE of Apollo 12. Ions resulting from the impacts of the Apollo 14 SIVB and the LM ascent stage were recorded by the Apollo 12 SIDE. Author

N71-30963*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

COLD-CATHODE-GAGE EXPERIMENT (LUNAR ATMOSPHERE DETECTOR)

F. S. Johnson (Tex. Univ. Dallas), D. E. Evans, (Tex. Univ., Dallas) and J. M. Carroll (Tex. Univ., Dallas) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 185–191 (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

A cold cathode gage experiment was used to determine the amount and source of gas present during nighttime and daytime in the lunar atmosphere. Results indicate that the concentration in the atmosphere during lunar nighttime is approximately 2 x 10 to the 5th power cu cm except when outgassing or other gas events occur. In lunar daytime the concentration is no greater than 10 to the 7th power cu cm and is still influenced by outgassing from the lunar surface experiments and the LM descent stage. The results also indicate the occurence of numerous gas events during both daytime and nighttime operations. E.H.W.

N71-30964*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

CHARGED-PARTICLE LUNAR ENVIRONMENT EXPERIMENT

Brain J. O'Brien (Sydney Univ.) and David L. Reasoner (Rice Univ.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 193–213 refs Sponsored in part by Sydney Univ. Sci. Found. in Phys., Australia (See N71-30953 18-30)

(Contracts NAS9-5884; NSR-44-006-004; NAS6-1061; NAS9-4822

Avail: SOD $3.00; NTIS CSCL 22A

During the first month of operation, the charged-particle lunar environment experiment (CPLEE) has detected particle fluxes at the lunar surface resulting from a wide range of lunar-surface, magnetospheric, and interplanetary phenomena. Preliminary data analysis has revealed the presence of a lunar photoelectron layer, an indication of modulation or acceleration of low-energy electrons in the vicinity of the Moon, penetration of auroral particles to lunar distances in the magnetospheric tail, detection of electron fluxes in the magnetospheric tail possibly associated with the neutral sheet, strong modulations of solar wind fluxes, and the appearance of ions and electrons or negative ions with energies up to 100 eV associated with the LM impact. E.M.C.

N71-30965*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

LASER RANGING RETROREFLECTOR

J. E. Fuller (Wesleyan Univ.), C. O. Alley (Md. Univ.), P. L. Bender (Joint Inst. for Lab. Astrophys.), D. G. Currie (Md. Univ.), R. H. Dicke (Princeton Univ.) et al *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 215–220 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

During the Apollo 14 mission, a second laser ranging retroreflector (LRRR) was deployed on the lunar surface. An observation program of several years' duration that results in an extended sequence of high-precision Earth-Moon distance measurements will provide data from which a variety of information about the Earth-Moon system can be derived. An obvious immediate use of these data will be to define more precisely the motion of the Moon in its orbit. An experimental result will be the measurement of the lunar librations–the irregular motions of the Moon about its center. Another major objective of this experiment is to learn more about the structure of the Earth. Author

N71-30966*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

THE SOLAR-WIND COMPOSITION EXPERIMENT

J. Geiss (Bern Univ. Physik Inst.), F. Buehler (Bern Univ. Physik. Inst.), H. Cerutti (Bern Univ. Physik. Inst.), P. Eberhardt (Bern Univ. Physik. Ints.), and J. Meister (Bern Univ. Physik. Inst.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 221–226 refs Supported in part by the Swiss NSF (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

During the Apollo 11, 12, and 14 missions, aluminum foils were deployed at the lunar surface and used as targets for collecting solar wind ions. The foils were returned to Earth, and the implanted solar wind particles are being analyzed in the laboratory. The Apollo 11 and 12 solar wind composition (SWC) experiments have so far yielded absolute solar wind fluxes of He-4, He-3, neon-20, and Ne-22. In the case of the Apollo 12 experiment, an approximate figure for the abundance Ne-21 was also obtained. Preliminary results of the first analyses on sections of the Apollo 14 foil are presented. Proton detectors and magnetometers were used to establish that the Moon behaves like a passive obstacle to the solar wind, and no evidence of a lunar bow shock was found. Author

N71-30967*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LUNAR PORTABLE MAGNETOMETER EXPERIMENT

P. Dyal, C. W. Parkin, C. P. Sonett (Okla. Univ.), R. L. DuBois, and G. Simmons (NASA. Manned Spacecraft Center) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 227–237 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

The Apollo 14 lunar portable magnetometer (LPM) was used to measure the steady magnetic field at different sites in the Fra Mauro region. The LPM recorded steady magnetic fields of 103 + or − 5 gammas and 43 + or − 6 gammas at two sites separated by 1.12 km. These measurements showed that the unexpectedly high 38-gamma steady field measured at the Apollo 12 site 180 km away was not unique. Indeed, these measurements and studies of lunar samples and lunar-orbiting Explorer 35 data indicate that much of the lunar-surface material was magnetized at some prior time in lunar history. These data can be used to gain information concerning present magnetic and structural properties of the local region as well as the thermal and magnetic histories of the area. Author

N71-30968*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

LUNAR-SURFACE CLOSEUP STEREOSCOPIC PHOTOGRAPHY

T. Gold (Cornell Univ.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 239–247 refs (See N71-30853 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

Closeup photographs of soil and rock on the lunar surface were obtained with the Apollo lunar-surface closeup camera (ALSCC). The ALSCC stereoscopic camera contains an internal strobe light and an external sundial that can be read in real time for postmission orientation of photographs. The ALSCC is capable of photographing an area 72 by 82.8 mm and of resolving objects as small as 0.085 mm in diameter. During the Apollo 14 mission, 17.5 stereopairs were obtained of various surfaces. The stereopairs include views of the tracks of the modularized equipment transporter, boot-prints, undisturbed lunar soil, the surface of a rock partially obscured by soil, and samples of thermal coatings taken in support of the thermal degradation samples experiment. Author

N71-30969*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GEGENSCHEIN-MOULTON REGION PHOTOGRAPHY FROM LUNAR ORBIT

L. Dunkelman, C. L. Wolff, R. D. Mercer (Dudley Obs.), and S. A. Roosa (NASA. Manned Spacecraft Center) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 249–252 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

Preliminary analysis results are summarized for the Apollo 14 lunar orbit photography of the gegenschein-Moulton region using a 16-mm camera equipped with an f/0.95 or T/1 lens. Libration points, triangulation, and an alternate explanation of the gegenschein phenomenon are discussed with the Moulton dust theory. Background experiment information is presented as well as the operational conduct of the Apollo 14 experiment. J.M.

N71-30970*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

S-BAND TRANSPONDER EXPERIMENT

W. L. Sjogren, P. Gottlieb, P. M. Muller, and W. R. Wollenhaupt (NASA. Manned Spacecraft Center) *In* NASA. Manned Spacecraft Center Apollo 14 Prelim. Sci. Rept. 1971 p 253–256 refs (See N71-30953 18-30)

Avail: SOD $3.00; NTIS CSCL 22A

Techniques and preliminary results are summarized for the Apollo 14 S-band transponder experiment which provides detailed information on the near-side lunar gravity field. The spacecraft velocity data measured from the real-time radio navigation systems onboard the orbiting command service and lunar modules are discussed. J.M.

N71-30971*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
BISTATIC-RADAR INVESTIGATION
H. T. Howard (Stanford Univ.) and G. L. Tyler (Stanford Univ.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 257–268 refs (See N71-30953 18-30)
Avail: SOD $3.00; NTIS CSCL 22A

The bistatic radar of Apollo 14 was used to determine, through radiofrequency electromagnetic scattering from the lunar surface, the principal electrical and structural properties of the lunar crust. For this experiment, continuous wave transmissions from the S band telemetry and the very high frequency communication systems, were used. Data were obtained in an inertial attitude hold. The data obtained were sampled, Fourier coefficient computed, and preliminary spectra examined. No data correlation was made. E.H.W.

N71-30972*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL-SCIENCE PHOTOGRAPHY. PART A: VOLCANIC FEATURES IN THE FAR-SIDE HIGHLANDS
Farouk El-Baz (Bellcomm, Inc.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 267–274 (See N71-30953 18-30)
Avail: SOD $3.00; NTIS CSCL 22A

Three photographic strips, using a Hasselbad camera with SO-368 color film and a 500-mm lens, were used to test some of the theories regarding far side upland volcanism of the lunar surface. The strips provided examples of the far side highlands from 160 degrees east to the eastern limb, and were taken on the Apollo 14 mission. All three strips and two additional targets were successfully recovered. E.H.W.

N71-30973*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART B: PRELIMINARY GEOLOGIC RESULTS FROM ORBITAL PHOTOGRAPHY
D. H. Scott (Geol. Surv.), M. N. West, (Geol. Surv.), B. K. Lucchitta (Geol. Surv.), and J. F. Mc Cauley (Geol. Surv.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 274–283 (See N71-30953 18-30)
(NASA Order T-65253G; NASA Order W-13130)
Avail: SOD $3.00; NTIS CSCL 22A

Previously unrecognized details on the morphology, structure, and stratigraphy of the moon, as revealed by the Hasselblad photographs taken from Apollo 14, are discussed. Particular attention is given to the sinuous rille. E.H.W.

N71-30974*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART C: HYCON PHOTOGRAPHY OF THE CENTRAL HIGHLANDS
Farouk El-Baz (Bellcomm, Inc.) and J. W. Head, III (Bellcomm, Inc.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 283–290 (See N71-30953 18-30)
Avail: SOD $3.00; NTIS CSCL 22A

The stereophotographs of the central highlands from the eastern rim of Theophilus Crater to a point northeast of Kant Crater, are analyzed. Terrain characteristics, probable rock origins, and material structures are also discussed. The photographs also provide necessary information for detailed crater studies. E.H.W.

N71-30975*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART D: GEOLOGY OF THE REGION AROUND THE CANDIDATE DESCARTES APOLLO LANDING SITE
Daniel J. Milton (Geol. Surv.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 290–292 (See N71-30953 18-30)
(NASA Order T-65253G; NASA Order W-13130)
Avail: SOD $3.00; NTIS CSCL 22A

An analysis is made of the possible landing site for Apollo 16 from data accumulated by Apollo 14 photography. A geologic sketch map was made which covered approximately 10,000 square km surrounding the Descartes region. Most of the mapped area is covered by plains-forming and hilly materials of the Imbrain age. Circumbesin materials are not distinguishable from the photographs, although thin deposits of ejecta from the Imbrium and Nectaris Basins may be present in the subsurface or exposed in an area associated with Donland B crater. Some transitional areas are also identified. E.H.W

N71-30976*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART E: SKETCH MAP OF THE CANDIDATE DESCARTES APOLLO LANDING SITE
Carroll Ann Hodges (Geol. Surv.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 293–296 (See N71-30953 18-30)
(NASA Order T-65253G; NASA Order W-13130)
Avail: SOD $3.00; NTIS CSCL 22A

A sketch map was prepared of the Descartes site of the lunar surface. The area, a proposed landing, site for Apollo 16, was mapped according to topographic expressions as furrowed, domal, and clustered hill units. Because the domal units were indistinguishable from the hilly and furrowed units in the photographs, these data were taken from a regional geologic map. E.H.W.

N71-30977*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART F: CORRELATION OF THE ZERO-PHASE BRIGHTNESS SURGE (HEILIGENSCHEIN) WITH LUNAR SURFACE ROUGHNESS
H. A. Pohn (Geol. Surv.), R. L. Wildey (Geol. Surv.), and T. W. Offield (Geol. Surv.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 296–297 (See N71-30953 18-30)
(NASA Order T-65253G; NASA Order W-13130)
Avail: SOD $3.00; NTIS CSCL 22A

Using visual inspection of Apollo 14 photographs and current geologic knowledge, it was established that there is apparently a direct correlation between brightness surge(heiligenschein effect) and subresolution roughness of the lunar surface as suggested by empirical experiments. The surge appears to decrease progressively from the rugged upland materials to the light plains, to a low in dark mare materials. Investigations show that a measurable correlation may exist between measurable photometric properties and the relative age of small craters. The brightness may also be used to determine fine scale surface roughness related to geologic conditions, soil porosity, moisture content, and type and conditions of local vegetation. E.H.W.

N71-30978*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART G: NEAR-TERMINATOR PHOTOGRAPHY
J. W. Head (Bellcomm, Inc.) and D. D. Lloyd (Bellcomm, Inc.) *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 297–300 (See N71-30953 18-30)
(NASA Order T-65253G; NASA Order W-13130)
Avail: SOD $3.00; NTIS CSCL 22A

A sequence of photographs was taken during the Apollo 14 mission under near terminator lighting conditions. Because of the contrast, greater detail is shown for small surface slope variations in the lunar surface. Detailed studies made from the photographs include mare features, craters, and surface lineaments. Emphasis is also given to upland terrain and its associated structures as well as deposits of Kunowsky crater. E.H.W.

N71-30979*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ORBITAL SCIENCE PHOTOGRAPHY. PART H: ASTRONOMICAL PHOTOGRAPHY
R. D. Mercer (Cornell Univ.), L. Dunkelman (Cornell Univ.), and S. A. Roosa *In its* Apollo 14 Prelim. Sci. Rept. 1971 p 300–302 refs (See N71-30953 18-30)
Avail: SOD $3.00; NTIS CSCL 22A

Photographs of the zodiacal light and the lunar liberation clouds are analyzed. The investigations were controlled through flight and ground support operations. Limited results show that all star fields were identified, camera pointing appears to be within 1 deg of the desired examing point, and the zodiacal light is evident to the unaided eye on at least half of the frames. E.H.W.

N71-30990# Environmental Science Services Administration, Miami, Fla.
OCEAN BASINS AND LUNAR SEAS
Robert S. Dietz *In its* Atlantic Oceanog. and Meteorol. Labs., Pacific Oceanog. Labs., Vol. 1 Sep. 1970 9 p Repr. from Oceans; v. 2, no. 1 p 7–15 (See N71-30980 18-13)
Avail: SOD $4.25

A comparison between the lunar maria and the ocean basins of Earth is presented. Three aspects in which maria differ from ocean basins are: (1) there is no general interconnection between the maria, (2) their depths in lunar crust differ rather than being uniform, and (3) unlike the earth's ocean basins and continental masses which are counterbalanced, the maria are underlain by heavy rock masses that are out of balance with the lunar uplands.
Author

N71-31031* National Aeronautics and Space Administration, Washington, D.C.
EOLE
6 Aug. 1971 15 p
(NASA-News-Release-71-144) Avail: NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Md. 20740 CSCL 22A

A French meteorological satellite, Eole, was prepared for launch from Wallops Station, Va., no earlier than August 16, 1971. The 186 pound satellite was developed by the French space agency in cooperative project with the U.S. National Aeronautics and Space Administration which will launch the spacecraft. The specific meteorological objectives of Eole are to reveal more about the circulation of the atmosphere from the tracks of the balloons, to provide a basis for a standard reference system of pressure and temperature to be used in the World Weather Program, and to learn more about local winds.
Author

N71-31032* National Aeronautics and Space Administration, Washington, D.C.
PLANETARY ATMOSPHERE EXPERIMENTS TEST (PAET)
13 Jun. 1971 23 p
(NASA-News-Release-71-99) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 22A

NASA was to launch no earlier than June 16, 1971, a probe vehicle with investigative means for determining the structure and composition of an unknown planetary atmosphere. The Planetary Atmosphere Experiments Test (PAET) was to provide a technical base for advanced planetary exploration to Mars, Venus, and eventually the outer planets.
Author

N71-31065*# Scientific Translation Service, Santa Barbara, Calif.
SPECTRAL EVIDENCE OF OUTFLOW OF MOLECULAR HYDROGEN IN THE REGION OF ARISTARCHUS [SPEKTRALNYYE PRIZNAKI VYKHODA MOLEKULYARNOGO VODORODA V RAYONE KRATERA ARISTARKHA NA LUNE]
N. A. Kozyrev Washington NASA Aug. 1970 8 p refs Transl. into ENGLISH from Izv. Glavnoi Astron. Observ. (Pulkovo), v. 24, pt. 1, no. 177, 1964 p 99–101
(Contract NASw-2035)
(NASA-TT-F-13809) Avail: NTIS CSCL 03A

Spectral observations of the crater Aristarchus during November and December 1961 showed a comparatively stable outflow of gas near its center. The emission band 4634 + or – 1 A with a sharp red border and weak emission in the orange-red spectral region were detected. These data are evidence that there was an outflow of molecular hydrogen of the fumarole type of Earth volcanoes.
Author

N71-31092*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
COMPARATIVE ANALYSES OF OBSERVATIONS OF LUNAR TRANSIENT PHENOMENA
Winifred Sawtell Cameron Jan. 1971 85 p refs Submitted for publication
(NASA-TM-X-65528; X-641-71-12) Avail: NTIS CSCL 03A

A collection of > 800 reports of lunar transient phenomena (LTP) contained 771 positive and 112 negative observations with sufficient ancillary data to be analyzed for five hypotheses of causes. Greater than one third of these reports involve Aristarchus, divided almost equally between two observing groups. One homogeneous group involved one observer, and the other heterogeneous group comprised all other observers. These two groups plus their combination were each separately analyzed for each hypothesis for Aristarchus. The observations seemed to form four categories, viz. (1) gaseous, (2) reddish, (3) bluish, and (4) colorless brightenings and were analyzed under each category for each hypothesis and group, as well as the total Aristarchus and total of all sites which were analyzed for each hypothesis. Each and all were compared. The five hypotheses involved the effects of (1) tides, (2) sunrise, (3) low-angle illumination, (4) earth's magnetic tail, and (5) solar particles.
Author

N71-31108*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
JPL QUARTERLY TECHNICAL REVIEW, VOLUME 1, NO. 2
Jul. 1971 269 p refs
(Contract NAS7-100)
(NASA-CR-119315) Copyright Avail: NTIS

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N71-31152*# Scientific Translation Service, Santa Barbara, Calif.
NEW INFORMATION ON PLANETARY ATMOSPHERES (SYMPOSIUM IN THE UNITED STATES) [NOVOYE OB ATMOSFERAKH PLANET]
N. N. Krupenio Washington NASA Sep. 1970 9 p Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), no. 3, 1970 p 67–70 Conf. held at Marfa, Tex., 26–31 Oct. 1969
(Contract NASw-2035)
(NASA-TT-F-13813) Avail: NTIS CSCL 03B

An international symposium in the United States in October, 1969, which was devoted primarily to studying the atmospheres of Mars and Venus. The majority of reports at the symposium were presented by American scientists. The conclusion was reached that the most complete information on the atmospheres and surfaces of the planets can be obtained by composite studies both from the Earth and from spacecraft. Author

N71-31178*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A SIGNIFICANT SATELLITE RELATIVITY EXPERIMENT WITHOUT AN ATOMIC OSCILLATOR
R. E. Jenkins Apr. 1970 21 p refs Sponsored in part by NASA
(Contract NOw-62-0604-c)
(NASA-CR-119378; TG-1114) Avail: NTIS CSCL 22A

An experiment is proposed for an accurate and reliable measurement of the periodic relativistic Doppler shift with a high-eccentricity, low-perigee-height orbit. Using a quartz crystal oscillator and existing proven hardware, the experiment would be both reliable and inexpensive, with very little development required. An analysis is made of the errors in a previous similar experiment that was completed with the GEOS-1 satellite. From the demonstrated capability in the GEOS-1 experiment, it is concluded that a relative accuracy of better than 1% would be attainable with an orbit eccentricity greater than 0.5. With an eccentricity as high as 0.9 the relative error would be of the order of 0.1%. Author

N71-31263*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF COSMOLOGICAL EXPANSION OF SELF-GRAVITATING ENSEMBLES OF PARTICLES
Peter D. Noerdlinger and Vahe Petrosian (Stanford Univ.) Stanford, Calif. Stanford Univ. Dec. 1970 22 p refs Supported in part by Am. Soc. for Eng. Educ.
(Contract N00014-67-A-0112-0006)
(NASA-TM-X-67240; AD-715348; SU-IPR-398) Avail: NTIS CSCL 03B

The authors consider the possible expansion of clusters or superclusters of galaxies, of mean rest mass density rho subscript c, immersed in a cosmos containing a gas of particles having zero rest mass and having energy density rho(c squared). The cosmos may also contain dust. It is shown that when rho > rho subscript c, the clusters of superclusters, respectively, expand with the Universe, but if rho subscript >> rho, the expansion is reduced in the ratio rho/rho subscript c. If therefore seems unlikely that clusters of galaxies could have formed if the present value of rho exceeds 10 to the -29 power gm/cc, unless most of this radiation was generated outside the clusters and subsequent to their formation. Superclusters, if they exist, will follow the expansion of a unverse of even lower energy density. Author (GRA)

N71-31256 California Univ., Los Angeles.
SOME CALCULATIONS OF COOLING RATES AND SPECTRAL EMISSION OF GASEOUS NEBULAE
Donald Peyton Cox (Ph.D. Thesis) 1970 189 p
Avail: Univ. Microfilms Order No. 70-14347

A general method of computing hydrogenic recombination decrements in gaseous nebulae is described. The effects of any combination of partial Lyman-line leakage, Balmer-line self-absorption, and internal dust can be calculated from known case A decrements. Sample calculations are made and their relevance to real nebulae discussed. Results of calculations of the ionization equilibrium and radiative cooling rate of a high temperature low density plasma are also presented. The elements H, He, C, N, O, Ne, Mg, Si and S are considered, and the temperature range is taken to be 1,000 to 10 to the eight power K. Electron collisions are assumed to be the only ionizing agent. Finally, the dynamic and radiative properties are calculated for a steady state shock wave traveling at about 100 km/sec into the interstellar medium. This is discussed as a possible explanation for the spectra of certain expanding shell-like filamentary nebulae such as the Cygnus Loop which may be very old supernova remnants. Guidelines are given for determining the shock velocity, the interstellar particle density, the helium abundance, and the ambient magnetic field strength from observable characteristics of any such flow. Dissert. Abstr.

N71-31260 California Univ., San Diego.
THE NEUTRAL PION DECAY, AND THE DIFFUSE GAMMA-BACKGROUND RADIATION
Giacomo Giulio Francesco (Ph.D. Thesis) 1970 185 p
Avail: Univ. Microfilms Order No. 70-17279

Recent experiments are discussed which produced observations of the diffuse radiation with photon energy larger than 50 MeV, and of a source along the galactic plane and an isotropic background of intensity 0.00011/(cm sq-sec sr). The plausible approach that the results are due to the superposition of discrete sources is discussed. The possibility that the dominant production mechanism is continuous is also discussed. The decay of neutral mesons produced in nuclear collisions of energetic primaries with the medium is thought to be the most important mechanism. The Turning to the metagalactic background, a simple method is introduce to take into account the effects of choosing different cosmological models. It is assumed that the primary cosmic flux is universal and due to an initial burst. The following conclusions were made: (1) Universal flux and initial burst produce far too many gamma rays. This result should not change substantially if the initial burst hypothesis is given up but source evolution is included. (2) It is impossible to explain at the same time the gamma-background as due to neutral pion decay, and the isotropic X-radiation as due to inverse Compton effect of secondary electrons. Dissert. Abstr.

N71-31279*# Interplan Corp., Santa Barbara, Calif.
REVIEW AND APPRAISAL: COST-BENEFIT ANALYSES OF EARTH RESOURCES SURVEY SATELLITE SYSTEMS
Roman Krzyczkowski, David N. Powell, Jr., and Evelyn S. Putnam Mar. 1971 161 p refs

(Contract NASw-2084)
(NASA-CR-119363; Rept-7016R) Avail: NTIS CSCL 22A

Ten studies concerned with the benefits and costs of remote sensing of earth resources were reviewed and appraised to assess: the extent to which the findings can be considered to be adequate indicators of the cost-benefit effectiveness of future operational ERS satellites, and the value of these studies of the ERS Program in directing R&D activities. The findings of this review and appraisal were used in formulating conclusions on the appropriate nature of future studies in the ERS Program. Author

N71-31295*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.

BASIC RESEARCH AND DATA ANALYSIS FOR THE NATIONAL GEODETIC SATELLITE PROGRAM AND FOR THE EARTH SURVEYS PROGRAM Semiannual Status Report, Jul. - Dec. 1970

Jan. 1971 34 p refs
(Grant NGL-36-008-093; OSURF Proj. 2514)
(NASA-CR-119357; SASR-7) Avail: NTIS CSCL 22A

The accomplishments during this period are reported. The final solution: SP-7 with SECOR observations on GEOS-1, for station coordinates was completed, and adjusted coordinates for the positions of Johnston, Maui, and Midway are tabulated. Other areas for which developments are reported include: satellite to satellite tracking investigating range observations, improving existing triangulation systems by satellite control points, and computer programming efforts. F.O.S.

N71-31296*# Analytical Mechanics Associates, Inc., Seabrook, Md.

LOW THRUST INTERPLANETARY TRAJECTORY OPEN LOOP ERROR ANALYSIS, VOLUME 1 Final Report

Samuel Pines, Andrew H. Jazwinski, and Fred I. Mann Feb. 1971 74 p refs
(Contract NAS5-11193)
(NASA-CR-119375; Rept-71-9-Vol-1) Avail: NTIS CSCL 22A

The theory and computer program are described for the open-loop error analysis of low thrust interplanetary trajectories. The main features of the theoretical analysis and program are (1) capability to perform error analyses for rather arbitrary space trajectories; (2) use of approximate closed form partial derivatives in the state transition matrices, resulting in significant computer time savings; and (3) capability of simulating arbitrary (as well as optimal) estimators or filters. As a result, the program developed represents a very flexible tool for the evaluation of estimators and navigation systems for space missions. Author

N71-31297*# Analytical Mechanics Associates, Inc., Seabrook, Md.

SWINGBY: A LOW THRUST INTERPLANETARY SWINGBY TRAJECTORY OPTIMIZATION PROGRAM, VOLUME 2 Final Report

Jerry L. Horsewood and Conrad Hipkins Mar. 1971 185 p refs
(Contract NAS5-11193)
(NASA-CR-119362; Rept-71-10-Vol-2) Avail: NTIS CSCL 22A

SWINGBY is presented as a segmented two-body low thrust interplanetary swingby trajectory and performance optimization program. The program explicitly includes both planetocentric and heliocentric phases by linking together a series of two-body, low thrust trajectories that are alternately planetocentric and heliocentric. At the patch points, the position and velocity are continuous, although the gravitational acceleration is discontinuous. Particular attention is given to the severe sensitivity problem inherent in swingby trajectories, and the program is designed to greatly alleviate the problem. Wide flexibility is provided in selecting the performance index and in specifying boundary conditions. Provisions are also made for generating optimum single leg trajectories. The indirect method of optimization is employed. Author

N71-31298*# Analytical Mechanics Associates, Inc., Seabrook, Md.

AN N-BODY LOW-THRUST TRAJECTORY PARAMETER OPTIMIZATION PROGRAM, VOLUME 3 Final Report

Samuel Pines, Henry Wolf, Jerry Horsewood, Leon Lefton, and Conrad Hipkins Mar. 1971 120 p refs
(Contract NAS5-11193)
(NASA-CR-119377; Rept-71-11-Vol-3) Avail: NTIS CSCL 22A

The modifications to the basic ITEM interplanetary trajectory program are described which are necessary to provide a capability of generating optimum low-thrust trajectories in an N-body field while satisfying selected hardware and operational constraints. The suggested approach consists of dividing the trajectory into a number of segments or arcs over which the control is held constant. This constant control over each arc is optimized using a parameter optimization scheme based on gradient techniques. As described, the program provides a wide range of constraint, end conditions, and performance index options. An equally important feature is that the basic approach is conducive to future expansion of features such as the incorporation of new constraints and the addition of new end conditions. Author

N71-31316*# Scientific Translation Service, Santa Barbara, Calif.

ORBITAL PARAMETERS AND LOCALIZATION OF METEOSAT [PARAMETRES D'ORBITES ET LOCALISATION DE METEOSAT]

F. Nouel Washington NASA Jan. 1971 39 p Transl. into ENGLISH from The French report FN/AC/0.5271/CB/MT
(Contract NASw-2035)
(NASA-TT-F-13832; FN/AC/0.527/CB/MT) Avail: NTIS CSCL 22A

The factors influencing the trajectory control of the 24 hour French Earth satellite METEOSAT are described. Computer simulation of the drift in position and orbit determination were made. It was found that the longitude is more poorly determined than either the latitude or radial distance. Author

N71-31316 Yale Univ., New Haven, Conn.

A SECOND ORDER SOLUTION FOR THE MOTION OF AN ARTIFICIAL EARTH SATELLITE BASED ON AN INTERMEDIATE ORBIT

Kaare Aksnes (Ph.D. Thesis) 1969 82 p
Avail: Univ. Microfilms Order No. 70-15666
Microfilms Order No. 70-15666

The problem of motion in the potential field is discussed. A complete second-order theory is developed which includes periodic terms to the second order and secular terms to the third order. The theory is distinguished by a relative simplicity and compactness of the final algorithm achieved by the use of the following special devices and techniques: (1) an intermediate orbit which incorporates all first-order secular terms and facilitates the calculation of the higher-order perturbations, (2) the Hori-Lie perturbation method and (3) a modification of the Hill variables to calculate perturbations in the coordinates and to preclude the appearance of mixed secular terms. A test of the theory is provided by integrating the equations of motion numerically for a series of initial conditions. A comparison shows that the position error of the theory is periodic with an amplitude less than 0.6m after at least one day of motion in orbits whose eccentricities range from 0 to 0.8. Dissert. Abstr.

N71-31331*# Scientific Translation Service, Santa Barbara, Calif.

PRELIMINARY DATA ON LUNAR SOIL SUPPLIED BY AUTOMATIC STATION LUNA-16 [PREDVARITELNYYE DANNYE O LUNNOM GRUNTE, DOSTAVLENNOM AVTOMATICHESKOY STANTSIEY LUNA-16]

A. P. Vinogradov Washington NASA Jul. 1971 28 p refs

Transl. into ENGLISH from Geokhimiya (USSR), no. 3, 1971 p 261–273
(Contract NASw-2035,
(NASA-TT-F-13756) Avail: NTIS CSCL 03B

Results of preliminary research on a sample of lunar soil obtained by automatic station Luna-16 are given. Data on the granulometric characteristics of the regolith are given, on its optical properties, types of rock components, and mineral content. The chemical composition is determined for macro- and microelements for various parts of the core sample and for lunar basalt. The isotopic composition of inert gases and several elements is studied. Age according to the Rb/Sr method is determined at 4.25-4.85 billion years. Author

N71-31332# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INVESTIGATION OF ARTIFICIAL METEORIC DUST (SPHERULES)
I. A. Yudin Jan. 1971 22 p refs Transl. into ENGLISH from Meteoritika (USSR), v. 29, 1969 p 132–141
(Rept-14) Avail: NTIS

A mineragraphic investigation of spherules made from nickel-iron, nickel-iron with silicate meteoritic material, and the silicate portion of meteorites. The spherules were prepared by introducing filings of metal and very small silicate particles between the electrodes of an electric arc. Depending on the mineral composition and structure of the spherules, four groups were identified as follows: (1) magnetite, (2) silicate-magnetite, (3) silicate of fine grain structure, and (4) silicate glass. Author

N71-31348 California Univ., San Diego.
RADIONUCLIDES IN METEORITES AND IN THE LUNAR SURFACE
Richard Mark Lindstrom (Ph.D. Thesis) 1970 213 p
Avail: Univ. Microfilms Order No. 70-15445

The analysis of radionuclides in meteorites and in the lunar surface is discussed. Three subjects presented are: (1) production of iodine 129 isotopes in meteorites and neutron capture cross section of iodine isotope, (2) gas proportional counting of transition-metal X ray emitters, and (3) chlorine-36, iron-55, and lead-210 quantitative analysis in lunar soil samples. Dissert. Abstr.

N71-31358*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.
BASIC RESEARCH AND DATA ANALYSIS FOR THE NATIONAL GEODETIC SATELLITE PROGRAM Semiannual Status Report, Jan. –Jun. 1971
Jul. 1971 79 p refs
(Grant NGL-36-008-093; OSURF Proj. 2514)
(NASA-CR-119356; SASR-8) Avail: NTIS CSCL 22A

Basic research and data analysis activities for the National Geodetic Satellite program are presented. Subjects discussed are: (1) gravity field refinement by satellite to satellite Doppler tracking, (2) investigations of critical configurations for fundamental range networks, (3) separating the secular motion of the pole from continental drift, and (4) investigations related to the problem of improving existing triangulation systems by means of satellite super control points. Author

N71-31388 Arizona Univ., Tucson.
OBSERVATIONAL ASPECTS OF CEPHEID EVOLUTION
Robert James Havlen (Ph.D. Thesis) 1970 204 p
Avail: Univ. Microfilms Order No. 70-13733

Three galactic classical cepheids are studies with their relationship to the surrounding stars and interstellar material. The observations are interpreted within the existing framework of present theories of cepheid evolution and origin of stars in groups. Isodensitometry is employed to analyze the reflection nebula for spatial and temporal light variations. No spatial variations in the nebular structure are found, but the intensity from three individual nebular features is found to vary with the same period as the cepheid. The radial color change of the nebula with increasing angular separation from RS Pup goes from blue to red, in support of the reflection character of the nebula. The observations suggest a model of the nebular consisting of several concentric spherically symmetric reflecting shells. Dissert. Abstr.

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N71-30483*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-5 DESPIN-MISSION MAGNETIC INVESTIGATION
T. N. Roy and J. C. Boyle Nov. 1970 29 p refs
(NASA-TM-X-65615; X-325-70-435) Avail: NTIS CSCL 22A

Apparatus for determining the feasibility of the proposed magnetic-despin concept for correcting attitude problems of spacecraft already in orbit were tested. A torquemeter was used to measure magnetic torques at various fixer-satellite and malfunctioning-satellite separation distances and angular orientations. The varying magnetic field, that a probe on board the despin satellite would view, caused by spin of the malfunctioning satellite was also measured. Author

N71-30620# European Space Research and Technology Center, Noordwijk (Netherlands).
HEOS-A2 SATELLITE FUNCTIONAL DESCRIPTION
J. de Waard, C. J. Kooter, S. Summerhill Jun. 1970 182 p refs
(ESRO-TN-104-ESTEC) Avail: NTIS

The primary scientific mission of the HEOS A2 satellite will be the investigation of interplanetary space and of the high latitude magnetosphere and its boundary in the region of the northern neutral point. The instrumentation of this satellite includes a magnetometer and a number of particle counting instruments. Together with these, instruments for VLF observation and micrometeorite detection are carried. To be compatible with the extremely sensitive VLF experiment the satellite had to be made electromagnetically clean. A functional description of all onboard subsystems, including the scientific experiments, is given. In addition the satellite checkout philosophy is presented. Author (ESRO)

N71-30633# European Space Research Inst., Frascati (Italy).
PRECISION MEASUREMENTS OF THE SOLAR GRAVITATIONAL FIELD [MISURE DI PRECISIONE DEL CAMPO GRAVITAZIONALE DEL SOLE]
Bruno Bertotti 1970 16 p refs In Italian Presented at the 14th Meeting of the Ital. Astron. Soc., Milan, 16–18 Oct. 1970
Avail: NTIS

Theoretically the solar gravitational field structure is defined by a geometry with spherical symmetry. The parameters appearing in such a metric are normally determined by measurement of the phenomena predicted by the relativity theory. An experiment is proposed for measuring the distance from the earth of a geodetical satellite consisting of twin spheres of the same dimensions but with different masses. Measuring this distance once a day during 100 days will give a precision of approximately 0.01 for the said parameters, if delta = 150 m is the mean square variation in the measurement of the earth/satellite distance. ESRO

N71-30664*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE RADIO ASTRONOMY EXPLORER SATELLITE, A LOW FREQUENCY OBSERVATORY

R. R. Weber, J. K. Alexander, and R. G. Stone Jun. 1971 45 p refs Submitted for publication

(NASA-TM-X-65616; X-693-71-64) Avail: NTIS CSCL 22B

The Radio Astronomy Explorer Satellite (RAE-1) is the first spacecraft designed exclusively for radio astronomical studies. It is a small, but relatively complex, observatory including two 229-m antennas, several radiometer systems covering a frequency range of 0.2 to 9.2 MHz, and a variety of supporting experiments such as antenna impedance probes and television cameras to monitor antenna shape. Since its launch in July, 1968, RAE-1 has sent back some 10 to the 10th power data bits per year on measurements of long wavelength radio phenomena in the magnetosphere, the solar corona, and the galaxy. A description is given of the design, calibration, and performance of the RAE-1 experiments in detail. Author

N71-30879# Groupe de Recherches Ionospheriques, Issy-les-Moulineaux (France).

RECAPITUALITVE LIST OF SATELLITES TO BE LAUNCHED BETWEEN 1971 AND 1975 [LISTE RECAPITUALTIVE DES SATELLITES DEVANT ETRE LANCES ENTRE 1971 ET 1975]

J. P. Legrand 31 Mar. 1971 31 p refs In FRENCH

(GRI/NTP/85) Avail: NTIS

The satellites to be launched between 1971 and 1975 for investigating the magnetosphere and other related phenomena are listed. The orbital elements, inclination, orbit period, satellite launching date, and lifetime are given and the onboard equipment and experiments mentioned. In addition a list of 33 ground stations working in 136 MHz is given along with a chart representing the world coverage of these stations tracking a circular orbit satellite at 1500 km distance. ESRO

N71-31033*# National Aeronautics and Space Administration, Washington, D.C.

ACCEPTANCE TESTING: SPACE VEHICLE DESIGN CRITERIA (STRUCTURES)

Apr. 1970 34 p refs

(NASA-SP-8045) Avail: NTIS CSCL 22B

Structural acceptance tests are conducted on flight hardware to verify that materials, manufacturing processes, and workmanship meet specifications, and that the hardware is suitable for flight. Acceptance tests follow design-development and qualification tests, and are the final series of tests conducted in a typical hardware program. To provide consistancy in procedures, criteria are presented which can serve as a checklist for guiding a design or assessing its adequacy and recommended practices for satisfying these criteria are given. Author

N71-31055*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE UTILIZATION OF HALO ORBITS IN ADVANCED LUNAR OPERATIONS

Robert W. Farquhar Washington Jul. 1971 106 p refs

(NASA-TN-D-6365; G-1025) Avail: NTIS CSCL 22A

Flight mechanics and control problems associated with the stationing of spacecraft in halo orbits about the translunar libration point are discussed. Practical procedures for the implementation of the control techniques are described, and it is shown that these procedures can be carried out with very small delta V costs. The possibility of using a relay satellite in a halo orbit to obtain a continuous communications link between the earth and the far side of the moon is also discussed. It is shown that, with a halo relay satellite, it would be possible to continuously control an unmanned lunar roving vehicle on the moon's far side. Backside tracking of lunar orbiters could also be realized. The desirability of locating a lunar space station in a halo orbit instead of a lunar polar orbit as recommended in the current NASA integrated program plan is investigated. It is found that the halo orbit location is superior in almost every respect. Of particular significance is the finding that the performance of a reusable lunar shuttle transportation system using halo orbit rendezvous is better than that of one using lunar orbit rendezvous. Author

N71-31076# Council for Scientific and Industrial Research, Pretoria (South Africa).

NEW VERSIONS OF THE METEOR-1 METEOROLOGICAL ROCKET [PROJEKTY ROZWOJOWYCH WERSJI RAKIETY METEOROLOGICZNEJ METEOR-1]

J. Harazny 1970 10 p Transl. into ENGLISH from Biul. Inf. Inst. Lotn. (Poland), v. 5, no. 2, 1968 p 8–10

Avail: NTIS

The designing of improved types of meteorological rockets is discussed. Three new versions of a rocket head for Meteor-1 have been designed and the possibility of increasing the rocket ceiling has been investigated. Author

N71-31145*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

STRUCTURAL DAMPING IN SATURN VEHICLES AND SCALE MODELS

Larry Kiefling and Homer Pack 8 Jul. 1971 14 p refs

(NASA-TM-X-64607) Avail: NTIS CSCL 22B

An empirical equation previously used to fit Saturn 1 dynamic test structural damping data is found to fit Saturn 1B and Saturn 5 bending and torsional modal structural damping data. It is shown that the equation is not applicable to longitudinal mode data or to any data for scale models of the Saturn vehicles. Since the Saturn series consisted of a large variety of configurations and stage sizes, the equation is believed to be usable for the prediction of structural damping of the bending and torsional modes for many future liquid propelled rocket vehicles. Author

N71-31241*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INVESTIGATION OF CONTROL-SURFACE INSTABILITIES ON LIFTING-BODY REENTRY VEHICLES AT A MACH NUMBER OF 15.4

Robert C. Goetz and Frederick W. Gibson Washington Aug. 1971 55 p refs

(NASA-TN-D-6301; L-7610) Avail: NTIS CSCL 22B

An experimental investigation was conducted primarily to determine whether a control-surface instability might exist for lifting-body reentry-vehicle configurations at a nominal Mach number of 15. Two types of tests were conducted to obtain information on flap behavior for a range of aeroelastic parameters and operating conditions. The first type involved a blunt two-dimensional model designed to explore the influence on flap response of a number of aeroelastic parameters, whereas the second type involved a more specific study of the flap behavior on a 1/30-scale model of a typical reentry vehicle. Author

N71-31264*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SUBSONIC STABILITY, CONTROL, AND PERFORMANCE OF A SHUTTLE CONCEPT WITH A BLENDED WING-BODY

Charles H. Fox, Jr. and Delma C. Freeman, Jr. Washington Jul. 1971 47 p refs

(NASA-TM-X-2341; L-7682) Avail: NTIS CSCL 22A

An investigation has been conducted in the Langley high-speed 7- by 10-foot tunnel to determine the longitudinal and lateral-directional aerodynamic characteristics of a model

representative of a high-cross-range orbiter with a blended delta wing-body at subsonic speeds. The model had a leading-edge sweep of 67.5 deg and tip fins having 5 deg toe-in and 15 deg roll-out. The model was tested over a Mach number range from 0.4 to 0.88 at angles of attack from approximately −4 deg to 20 deg. The results of the investigation indicate that at low-subsonic Mach numbers the model, with the moment center at 66.7 percent of the body length, is stable up to an angle of attack of 11 deg, where a slight pitch-up occurs. Increasing the Mach number of 0.8 delays this pitch-up until an angle of attack of 18 deg is reached. Large elevon deflections were required to trim the model because of the large negative values of zero-lift pitching moment and the low elevon effectiveness. The resulting values of trimmed lift and trimmed lift-to-drag ratio were undesirably low. Removing the fuselage boattailing and tip-fin camber decreased the negative zero-lift pitching moment slightly; however, there was no net gain in performance. The model was directionally stable and had positive effective dihedral at the lowest Mach number, but increasing the Mach number to 0.8 resulted in a loss of directional stability. Author

N71-31258*+ National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A SOLUTION TO THE PROBLEM OF EVACUATING A SPACECRAFT CANISTER

Philip Teshber, Geoffrey Hintze, and W. Walding Moore, Jr. 7 Jul. 1971 70 p refs

(NASA-TM-X-64606) Avail: NTIS CSCL 22B

A theoretical description is presented for the evacuation at atmospheric pressure of a cylindrical canister which is vented into the environment of orbital space through apertures of varying sizes. Specifically, gas kinetics and vacuum physics are applied to mathematically analyze, for various outgassing rates, the minimum pressure ranges attainable by the canister. Supporting tables of data are provided. Author

N71-31300# European Space Research Organization, Paris (France).

ESRO STUDY PROGRAMME FOR A SPACE EXPERIMENT ON GRAVITATION THEORIES

G. M. Israel Mar. 1971 17 p

(ESRO-SM-78) Avail: NTIS

An introduction to the ESRO current studies for the definition of a space mission to test the gravitation theories is given. This mission consists of injecting a drag-free probe into a heliocentric orbit. It is also suggested to improve the time-delay tests by performing a one-way experiment with a pulsed laser beam. Author (ESRO)

N71-31406*# General Dynamics/Convair, San Diego, Calif.

TELEVISION BROADCAST SATELLITE STUDY, TVBS SYSTEM. VOLUME 1: EXECUTIVE SUMMARY

31 Dec. 1970 53 p refs

(Contract NAS8-21036)

(NASA-CR-119886; GDC-DCF70-002-Vol-1) Avail: NTIS CSCL 22B

The technological and cost factors affecting the feasibility of television broadcast satellites in the 1970–1975 time period are presented. This objective was met by synthesizing feasible spacecraft configurations to meet realistic user requirements. The spacecraft considered were unmanned or used Apollo hardware and were initially man-assisted during the first 15–45 days of orbital operation. In order to provide some range to the spacecraft considered the payload capability of the assigned Saturn 5 launch vehicle was configured for single and multiple satellites. The multiple satellites were each compatible with the payload capability of a smaller launch vehicle. The synthesis approach adopted included consideration of the total communication system elements – space and ground. Minimum total cost solutions were derived from each case from which the proper balance between the space and ground segments was identifiable. The final product of the study is a selection of three candidate spacecraft configurations, one unmanned and two potentially man-assisted for further analysis. Author

N71-31407*# General Dynamics/Convair, San Diego, Calif.

TELEVISION BROADCAST SATELLITE STUDY, TVBS SYSTEM. VOLUME 2: TECHNICAL REPORT

31 Dec. 1970 361 p refs

(Contract NAS8-21036)

(NASA-CR-119887; GDC-DCF70-002-Vol-2) Avail: NTIS HC $6.00/MF $0.95 CSCL 22B

The specifications and guidelines under which a study of the feasibility of a television broadcast satellite was conducted are presented. Subjects discussed are: (1) launch vehicle, (2) spacecraft, (3) orbit and coverage, (4) transmission, and (5) receiving systems. Author

N71-31408*# General Dynamics/Convair, San Diego, Calif.

TELEVISION BROADCAST SATELLITE STUDY, TVBS SYSTEM. VOLUME 3: SERVICE DESCRIPTIONS

31 Dec. 1970 63 p refs

(Contract NAS8-21036)

(NASA-CR-119888; GDC-DCF70-002-Vol-3) Avail: NTIS CSCL 22B

A minimum cost system of geostationary satellite relays to provide worldwide television service is described. The service will transfer television data from two originating stations to virtually a worldwide service area by way of two satellites with five down beams for the Pacific regions and four down beams for the Atlantic regions. Author

N71-31409*# General Dynamics/Convair, San Diego, Calif.

TELEVISION BROADCAST SATELLITE STUDY, TVBS SYSTEM. VOLUME 4: APPENDICES

31 Dec. 1970 152 p refs

(Contract NAS8-21036)

(NASA-CR-119889; GDC-DCF70-002-Vol-4) Avail: NTIS CSCL 22B

The engineering details and technical features of a television broadcast satellite are presented. Subjects discussed are: (1) power conditioning, (2) telemetry and command, (3) cost of the up-link ground terminal, and (4) the up-link receiver. Author

N71-31410*# General Dynamics/Convair, San Diego, Calif.

TELEVISION BROADCAST SATELLITE STUDY, TVBS SYSTEM. VOLUME 5: SYNTHESIS/OPTIMIZATION COMPUTER PROGRAM

31 Dec. 1970 250 p

(Contract NAS8-21036)

(NASA-CR-119890; GDC-DCF70-002-Vol-5) Avail: NTIS CSCL 22B

The Television Broadcast Satellite system synthesis/optimization program provides the user with a flexible tool for the analysis of TVBS system requirements. While obtaining minimum cost design points, the program enables the user to perform studies over a wide range of user requirements and spacecraft configurations. The program utilizes a total systems approach in which the ground uplink, spacecraft, launch vehicle, and ground downlink systems are simultaneously synthesized. A steepest-descent algorithm is employed to determine the minimum total system cost design for each configuration considered. In the process of converging to the solution, the pertinent subsystem trade-offs are resolved. Author

N71-31431*# Stevens Inst. of Tech., Hoboken, N.J. Combustion Lab.

A CRITERION FOR SPACE CAPSULE FIRE HAZARD MINIMIZATION, PART 5

Robert F. McAlevy, III and Richard S. Magee *In its* The Invest. of Flame Spreading over the Surface of Igniting Solid Propellants 31 Mar. 1971 2 p refs Repr. from J. Spacecraft Rockets, 1967; see A67-40110 (See N71-31426 18-33)
Copyright. Avail: NTIS CSCL 22B

The mechanism of flame spreading over the surface of igniting solid materials was studied by testing polystyrene and polymethyl methacrylate in a chamber filled with oxygen-nitrogen, oxygen-helium, and oxygen-argon mixtures having various oxygen mole concentrations at pressures between 4 and 415 psia. It is concluded that in a two-gas system, nitrogen is the best choice of inert diluent, and helium the worst of the three. It is recommended that the decision to use an oxygen-helium environment for the U.S. Air Force Manned Orbital Laboratory be re-examined in the light of these results. F.O.S.

N71-31462# Lowell Technological Inst. Research Foundation, Mass.
DESIGN AND FABRICATION OF SOUNDING ROCKET PAYLOADS
Richard E. Kenyon Mar. 1971 32 p
(Contract F19628-70-C-0149)
(AD-722459; LTIRF-324/SE; AFCRL-71-0072; SR-1) Avail: NTIS CSCL 19/7

The report reviews work accomplished from February 1970 through January 1971 on the design, integration and launch support of various sounding rocket payloads. A synopsis of each payload states the basic experimental objectives of the payload; the support electronics and instrumentation supplied; and the results of launch support efforts. Additional material presents a versatile battery charger; a squib power monitor assembly; and the results of evaluation of magnetic detection techniques for motion and position monitoring. Author (GRA)

N71-31467*# National Aeronautics and Space Administration, Washington, D.C.
ROCKET AERODYNAMICS
N. F. Krasnov, ed. et al Jun. 1971 1045 p refs Transl. into ENGLISH of the book "Aerodinamika Raket" Moscow, Vysshaya Shkola Press, 1968
(NASA TT-F-601) Avail: NTIS HC$9.00/MF$0.95 CSCL 16D

The basics of modern high-speed aerodynamic theory, calculation of force and heat effects of the environment on the vehicle, and the most important characteristics of flows for various states of gas are presented. Two trends are discerned: study of the forces that the medium exerts on the body moving in it and thermal and chemical processes on the skin of the vehicle. The effects of thermochemical reactions on the gas dynamic variables and their distributions are determined separately. Attention is given to nonsteady flows past bodies of various shapes. General discussions of forces, moments, and aerodynamic characteristics, vehicle and vehicle-element shapes, gas-flow theory, and the general methods of solution of aerodynamic problems (characteristics, sources, slender-body-theory, conformal-mapping, reversibility, attached-mass, etc.) are included. Author

N71-31547*# National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.
SPACE SHUTTLE VEHICLE AND SYSTEM Patent Application
Maxime A. Faget, inventor (to NASA) 37 p Filed 4 Jan. 1971
(NASA-Case-MSC-12433-1; US-Patent-Appl-SN-103551) Avail: NTIS CSCL 22B

A space shuttle system is described comprising two reusable stages, joined in piggyback fashion for lift-off, with each stage being a manual attitude controlled vehicle having fixed, aerodynamic support and control surfaces for horizontal atmospheric flight and conventional, near stall, aircraft landings. The fuselage bottom surface of each stage is transversely relatively flat and longitudinally cambered to provide dynamic lift at hypersonic atmosphere re-entry velocities and high angles of attack. Newtonian fluid flow states over bottom surfaces and dispersion of flow stagnation regions over large areas hold vehicle surface temperatures to tolerable levels during re-entry. Other aerodynamic criteria are balanced so that each stage will have stable flight characteristics at both high and low attack angle attitudes during both the re-entry and the subsonic atmospheric flight phases. NASA

N71-31582# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
VARIABLE SAMPLING RATE SAMPLED DATA ADAPATIVE CONTROL OF FLEXIBLE AEROSPACE VEHICLES
D. P. Passeri and R. M. Willett Dec. 1970 121 p refs
(Contract N00014-68-A-0162)
(AD-723846; ERI-93500) Avail: NTIS CSCL 20/11

Adaptive sample-data control of time-varying bending modes of a flexible airframe is analyzed. Adaptive control is achieved by variation of the sampling rate in conjunction with a fixed digital compensator. Means for the identification of the bending modes are conceived and analyzed. Simulation results of the adaptive control scheme are shown to verify the adaptive control technique. Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N71-30435# Royal Aircraft Establishment, Farnborough (England).
ON THE TORSION OF A CIRCULAR BEAM HAVING A CRACK ALONG A CIRCULAR ARC OR ALONG THE RADIUS [O KRUCHENII KRUGLOGO BRUSA S TRESHCHINOI PO DUGE OKRUZHNOSTI ILI PO RADIUSU]
E. A. Shiryaev Feb. 1971 13 p refs Transl. into ENGLISH from Prikl. Mat. i Mekh. (Moscow), v. 20, no. 4, 1956 p 555–558
(RAE-Lib-Trans-1559) Avail: NTIS

An examination is made of the problem of the torsion of a uniform isotropic circular beam having a crack along a circular arc or along the radius. The problem is solved using conformal mapping techniques. The complex torsion functions are determined and the torsional rigidity is calculated from formulae indicated by Muskhelishvili. Author

N71-30563# Southampton Univ. (England). Inst. of Sound and Vibration Research.
MEASUREMENT OF DYNAMIC SHEAR PROPERTIES OF SILICONE BASED ELASTOMERS USED AS DAMPING MATERIALS
C. T. Coote and F. Cicci Dec. 1970 39 p refs
(ISVR-TR-43) Avail: NTIS

Some dynamic shear properties of silicone based elastomers at elevated temperatures were measured. The apparatus was developed to measure the real part of the shear modulus and the loss factor at temperatures up to 150 C, using a forced vibration technique. Tests were conducted over a frequency range from 200 to 1000 Hz and various levels of shear strain up to a value of 0.1% were maintained. Results show the variation of shear modulus and loss factor with temperature, frequency, and strain for two different materials. The most satisfactory results were obtained with a fluorinated silicone rubber specimen having a shear modulus of 350 to 60 lb/ sq in and a loss factor of between 0.2 and 0.7 maintained from room temperature up to 150 C. Author (ESRO)

N71-30584# Atomic Energy of Canada, Ltd., Chalk River, (Ontario).
STRESS RELAXATION TESTING OF SMALL BENT BEAMS: AN EVALUATION OF SOME OUT-OF-PILE TESTS
D. E. Fraser Jan. 1971 24 p refs
(AECL-3782) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $1.50

The relative stress relaxation behavior at 300 C of cold-worked Zircaloy-2, cold-worked Zr-2.5 wt % Nb and heat-treated Zr-2.5 wt % Nb pressure tube materials was evaluated and compared using a power function from time hardening creep theory. The function fitted satisfactorily over the time range from 1000 to 10,000 hr. Creep rates calculated from stress relaxation data compared reasonably well with experimental creep data. Relaxation tests to determine relative creep behavior seem promising, but should not be substituted for creep tests to determine design creep data at the present time. Author (NSA)

N71-30783*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOME FACTORS THAT AFFECT THE INSPECTION OF AIRCRAFT FOR FATIGUE DAMAGE
C. C. Poe, Jr. and Herbert A. Leybold *In its* NASA Aircraft Safety and Operating Probl., Vol. 1 1971 391–401 refs (See N71-30756 18-02)
Avail: NTIS HC$6.00/MF$0.95 CSCL 13M

On the basis of fatigue crack growth and residual strength, a relationship between inspection interval and length of the smallest crack that must be detected to prevent failure within the inspection interval was determined. The effect on inspection of material, structural configuration, and aircraft load spectra was investigated. The results show that the efficient use of high-strength materials requires frequent inspection for very small cracks, that the use of stiffeners can result in a tolerance for long cracks and less frequent inspections, and that aircraft with fighter-type usage must be inspected much more frequently than aircraft with transport-type usage. Author

N71-30804# Weidlinger (Paul) Consultants, New York.
DISCRETE ANALYSIS FOR THE DYNAMIC RESPONSE OF STIFFENED SHELLS
Azriel Harari and Melvin L. Baron Mar. 1971 76 p refs
(Contract N00014-70-C-0359)
(AD-722465; TR-10) Avail: NTIS CSCL 20/11

The natural frequencies and mode shapes for the vibrations of stiffened cylindrical shells with or without hemispherical end caps are evaluated. The approach utilizes a discrete theory in which the shell elements and the stiffeners are considered as separate structures and compatibility is enforced at their junctures. The results are compared with those from continuum theory in which the stiffener effects are smeared over the shell. Numerical results are presented for frequencies and mode shapes for several cases of interest. The theoretical results have been compared with a set of experimental results from the Ordnance Research Laboratories and excellent agreement has been found. Upon publication of the experimental results, the detailed comparisons of theory and experiment will be distributed as a supplement to this report. Author (GRA)

N71-30883*# Scientific Translation Service, Santa Barbara, Calif.
IMPACT OF SPHERICAL SHELLS AGAINST THE SURFACE OF A LIQUID [UDAR SFERICHESKOY OBOLOCHKI O POVERKHNOST ZHIDKOSTI]
A. G. Gorshkov et al Washington NASA Jul. 1971 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), no. 6, Nov.–Dec. 1970 p 90–92
(Contract NASw-2035)
(NASA-TT-F-13578) Avail: NTIS CSCL 20K

During an impact of a body against a liquid, the values and the character of the distribution of the hydrodynamic load on the surface of the body are influenced by many factors. An analysis was made of the vertical impact of a thin, mildly sloping spherical shell against the surface of an ideally incompressible liquid. The contour of the shell leans against an elastic rib which is attached to a rigid body of mass M sub 0. The mass of the rigid body, M sub 0, exceeds many times the mass of the shell, m sub 0. It is assumed that the initial impact velocity v sub 0 is small compared to the velocity of sound c in the liquid. Author

N71-30906# Damascus Univ. (Syria).
BENDING OF CYLINDRICAL SHELLS SOLUTION USING CYLINDRICAL STRIP ELEMENTS (1). FINITE ELEMENT ANALYSIS OF CYLINDRICAL SHELLS SOLUTION USING RECTANGULAR CIRCULAR CYLINDRICAL ELEMENTS (2)
Jaroslav Jirousek 1970 58 p refs *Its* ACTA Polytech. Scand., Mathematics and Computing Machinery Ser. 20
(PB-195987; APS-MA-20) Avail: NTIS CSCL 20K

The following topics are discussed: principle of the solution; stiffness matrix of the cylindrical strip element; recurrent form of solution suitable for digital computers; cylindrical shells with longitudinal ribs; standard routines in ALGOL language; some results of the solution. Author (GRA)

N71-31054# Indian Inst. of Science, Bangalore. Dept. of Aeronautical Engineering.
DESIGN DATA ON BUCKLING OF CLAMPED SKEW PLATES (ORTHOGONAL COMPONENTS). PART 1: INDIVIDUAL LOADING
Mahabaliraja and S. Durvasula Apr. 1971 81 p refs
Avail: NTIS

The buckling problem of clamped skew plates under individual loading was considered. Galerkin method was used employing a double series of beam characteristic functions of a clamped-clamped beam for the buckling mode. Convergence studies were made for some typical skew angles for each type of individual loading. Numerical results were obtained for wide ranges of plate configurations and are presented in the form of tables and graphs which should be of value in design. Some interesting features associated with buckling behavior under shear (positive and negative) are also discussed. Author

N71-31071 Wisconsin Univ., Madison.
SHUBNIKOV-DE HAAS EFFECT IN UNIAXIALLY STRESSED BISMUTH
Andrew Brian Holland (Ph.D. Thesis) 1969 168 p
Avail: Univ. Microfilms Order No. 70-3557

The effects of uniaxial and shear stress on the conduction and valence bands of bismuth are discussed. The amount of overlap of the conduction and valence bands as a function of applied stress was measured by studying the stress-induced changes in the periodicity of the quantum oscillations of the resistivity (Shubnikov-de Haas Effect) at temperatures between 1.12 K and 4.2 K and in magnetic fields of 10 kilogauss. Three distinct stress experiments, namely 1) uniaxial stress parallel to the trigonal axis, 2) uniaxial stress perpendicular to the trigonal axis, and 3) shear-stress were employed. Dissert. Abstr.

N71-31118*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Engineering Mechanics Div.
ON THE STATISTICAL DISTRIBUTION OF SPACECRAFT MAXIMUM STRUCTURAL RESPONSE
J.-N. Yang *In its* JPL Quart. Tech. Rev., Vol. 1, No. 2 Jul. 1971 p 71–79 refs (See N71-31106 18-30)
Copyright. Avail: NTIS CSCL 13M

A direct statistical analysis of spacecraft maximum structural response is performed, and the spacecraft structural reliability is obtained. It is found that the Gumbel Type 1 asymptotic distribution of maximum values provides a reasonably good statistical model for spacecraft maximum structural responses. The current approach makes it possible to perform the reliability-based optimum design of spacecraft structures. Author

N71-31281*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BUCKLING OF BORON/ALUMINUM AND GRAPHITE/RESIN FIBER COMPOSITE ANISOTROPIC PANELS
C. C. Chamis 1971 12 p refs Proposed for presentation at Fall Meeting of the Soc. of Aerospace Material and Process Engineers, Huntsville, Ala., 5–7 Oct. 1971
(NASA-TM-X-67880; E-6455) Avail: NTIS CSCL 20K

Theoretical results are presented for the buckling of anisotropic plates. The plates are subjected to simple and combined inplane loading. The plates are made from fiber composite material of boron/aluminum or high modulus graphite/resin. The results are presented in nondimensional form as buckling load versus fiber orientation angle for various plate aspect ratios. Author

N71-31339# Stanford Univ., Calif. Dept. of Applied Mechanics.
SOME RECENTLY DEVELOPED ASPECTS OF PLASTIC WAVE ANALYSIS
E. H. Lee Dec. 1970 31 p refs
(Contract DA-04-200-AMC-659(X))
(AD-722780; TR-197; BRL-CR-28) Avail: NTIS CSCL 20/11

The analysis of the propagation of plastic waves for one-dimensional stress and one-dimensional strain are compared and contrasted. The former pertains to waves along a thin rod or wire, the latter to waves through a slab. The influence of finite strain is studied in some detail. The theory of the propagation of plastic waves of combined stresses is reviewed with particular emphasis on the waves propagated in one space dimension due to the application of perpendicular, independent, uniform shear tractions on the surface of a half-space. Solutions obtained numerically from characteristic theory are discussed, and some unexpected features of the coupling between stress components are remarked upon. Simple wave solutions are also reviewed, and aspects pertinent to tests for dynamic plastic material characteristics are mentioned. Some recent work clarifying aspects of the determination of elastic-plastic boundaries is also described. Author (GRA)

N71-31367 Rutgers Univ., New Brunswick, N.J.
THERMO-MECHANICAL AND MICROSTRUCTURAL EFFECTS ON INTERGRANULAR CREEP IN SINTERED AND FUSED CAST ALUMINAS
Robert William Matolka (Ph.D. Thesis) 1970 236 p
Avail: Univ. Microfilms Order No. 16942

A study of creep in torsion was made on sintered and fused cast aluminum oxide. Deformation was measured optically on samples shaped as thin parallelepipeds. Low stresses and small sample size resulted in predominantly intergranular deformation. Grain sizes varied from several microns to 100 microns for sintered alumina and from 50 to greater than 250 microns for fused cast alumina. The sintered alumina contained at least 99 percent alumina in the initial composition and the fused cast alumina contained at least 97.5 percent alumina in the initial composition. The principle effort was to determine the effect of thermal treatment on intergranular creep for the various microstructures, particularly fused cast alumina, and examine the existence of a thermal equilibrium effect on the intergranular creep of sintered alumina. The creep for sintered alumina was viscous and transient. The creep behavior of fused cast alumina reflected the large grain size and metastable conditions that existed. Dissert. Abstr.

N71-31415*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
FOLDABLE CONSTRUCTION BLOCK Patent Application
William C. Huber and Dale L. Ritter, inventors (to NASA) 15 p Filed 18 Jan. 1971
(NASA-Case-MSC-12233-2; US-Patent-Appl-SN-107298) Avail: NTIS CSCL 13M

A construction block which may be assembled by folding a pre-cut flat sheet of material to form a closed container is described. The blocks may be assembled, filled with any available material, and stacked in courses at the construction site. Also, the block may be folded to provide either two laterally symmetrical interlock tabs for lateral wall runs or one lateral and one transverse tab for wall corners. Author

N71-31483# Stanford Univ., Calif. Dept. of Applied Mechanics.
CONSTITUTIVE RELATIONS FOR DYNAMIC STRESSING
E. H. Lee Aberdeen Proving Ground, Md. Aberdeen Res. and Develop. Center Dec. 1970 34 p refs
(Contract DA-04-200-AMC-659)
(AD-722831; TR-196; BRL-CR-29) Avail: NTIS CSCL 20/11

The structure of the constitutive relations which govern the force-deformation laws for continuous media are analysed. It is pointed out that the classical laws commonly used in stress analysis often need to be generalized for satisfactory application to short-time dynamic loading. Some such generalizations introduced to cope with so-called real material behavior are assessed. The formulation of constitutive laws to include finite deformation, irreversible phenomena and the generation of permanent changes of shape are discussed for general motion in three dimensions. The simplification of these laws for one-dimensional strain, such as occurs in the propagation of plane irrotational waves is considered. The relation of this general approach to the analysis of dynamic loading of materials is also presented. Author (GRA)

N71-31484*# Translation Consultants, Ltd., Arlington, Va.
SOME RESULTS OF RESEARCH ON HIGH VELOCITY IMPACTS [NEKOTORYYE REZUL'TATY ISSLEDOVANIYA VYSOKOSKOROSTNYKH SOUDARENIY]
L. V. Leontev et al Washington NASA Aug. 1971 48 p refs Transl. into ENGLISH from Russian Report Pr-48
(Contract NASw-2038)
(NASA-TT-F-13740; Pr-48) Avail: NTIS CSCL 20K

Experimental data on the impacts of various materials in the range of velocities up to 20 km/sec is presented. Preliminary relations are obtained for estimating the effect of the strength properties of the materials of colliding pairs. It is shown that at collision speeds exceeding 12 km/sec, the interaction mechanism of the projectile and the target changes, thermal explosion of the projectile occurs. The conclusions are applied to an interpretation of the experiments on puncture in space. On the basis of these conclusions the concentration of micrometeoritic material in the vicinity of the earth is estimated. Author

N71-31485*# North Carolina State Univ., Raleigh.
COMPENDIUM OF MODAL DENSITIES FOR STRUCTURES
F. D. Hart and K. C. Shah Washington NASA Jul. 1971 106 p refs
(Grant NGL-34-002-035)
(NASA-CR-1773) Avail: NTIS CSCL 20K

The concept of modal density or density of eigenvalues of various structural elements of engineering importance is discussed. Expressions and graphs are presented that can be used to estimate the average modal densities of these elements and are valid for elements having any prescribed boundary conditions. Cases are considered for rods, beams, solid rectangular and circular plates, thin cylindrical, spherical and conical shells, composite structures, shallow sandwich shells, orthorotropic plates, pretwisted

plates, plates subject to in-plane forces and shells on an elastic foundation. For each of the elements up to a composite structure, graphs are plotted using dimensionless parameters to generalize the applications of the results; however, for the rest of the elements, graphs are plotted by choosing some arbitrary dimensions to illustrate the effect on modal density. Author

N71-31571# State Univ. of New York, Stony Brook.
FATIGUE ENHANCEMENT OF DIFFUSION Progress Report, 1 Jun. 1970–31 May 1971
Herbert Herman 1971 12 p refs
(Contract AT(30-1)-4097)
(NYO-4097-2) Avail: NTIS

It has been demonstrated that low amplitude cyclic straining can give rise to high vacancy concentrations with an attendant enhancement in diffusion. This effect was studied by cyclic strain induced ordering of disordered alpha brass. A frequency effect was discovered which suggests that the increased rate of kinetic energy input into the specimen with increased straining frequency will yield a greater rate of formation of point defects. This frequency dependence was not observed in crack formation, and hence implies that voids due to agglomeration of fatigue generated vacancies are not related to fatigue cracks. The lack of a clear test temperature dependency in the latter process also leads to this conclusion. However, the technological significance of this study is significant when considering the fatigue induced softening of metastable alloys which are strong by virtue of transition phases. Fatigue enhanced diffusion can be expected to threaten the persistence of these phases by giving rise to resolution for coarsening. Author

N71-31593# Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.
STRESSES IN SPHERICAL SHELLS DUE TO LOCAL LOADINGS
Robert Kao and Nicholas Perrone Sep. 1970 20 p refs
(Contract N00014-68-A-0506-0001; Proj. Themis)
(AD-723539; Rept-71-4) Avail: NTIS CSCL 20/11

The maximum stresses in a spherical shell are obtained which is lifted or towed by a cable or any mechanical power hoist. In view of the highly localized nature of the maximum stress induced in a spherical shell due to local loading, the nonlinear (large deflection) shallow shell theory is adopted for the analysis. A nonlinear relaxation technique in conjunction with finite difference approximations is introduced for the numerical integration. Results obtained here are presented in the graphic form which may be readily used by engineers in practical design. Author (GRA)

N71-31595# Massachusetts Inst. of Tech., Cambridge. Dept. of Naval Architecture and Marine Engineering.
INVESTIGATION OF DISTORTION REMOVAL IN WELDED STRUCTURES Final Report
Richard A. Walsh, David K. Duffy, and Koichi Masubuchi Nov. 1970 51 p refs
(Contract DOT CG-92784-B)
(AD-721537) Avail: NTIS CSCL 13/5

The objective of the study is to investigate mechanisms of flame straightening with emphasis on its effectiveness on high-strength-steel structures. In the Phase 1 study an investigation was made of mechanisms of flame straightening on simple weldments in low-carbon steel and HY-80 steel (quenched and tempered steel with specified minimum yield strength of 80,000 psi). Flame straightening was two to three times more effective on low-carbon steel specimens than on HY-80 steel specimens. In the Phase 2 study an investigation was made of mechanisms of flame straightening on framed panel structures. The specimens were made in low-carbon steel (AISI 1020), low-alloy high-strength steel (U. S. Steel CORTEN), and quenched and tempered steel (U. S. Steel T-1). It was also found that flame straightening techniques were more effective on low-carbon steel specimens than on high-strength steel specimens. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N71-30478# Eidgenoessiches Institut fuer Reaktorforschung, Wurenlingen (Switzerland).
HEAT EXCHANGERS FOR GAS TURBINE FAST REACTORS
L. A. Lys and I. von Allmen Oct. 1970 14 p refs Presented at the BNES Intern. Conf. on Nucl. Gas Turbines, London, 8–9 Apr. 1970
(EIR-187; Conf-700430-1) Avail: AEC Depository Libraries

The use of large regenerators and coolers clearly affects the efficiency of gas turbine fast reactor plants. This equipment, however, generally represents a significant cost item and therefore, it is necessary to determine a compromise between the cost savings resulting from the increased efficiency and the capital expenditure for the equipment required. The selection of proper designs for the regenerator and coolers is described. Author (NSA)

N71-30485# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.
INVESTIGATION OF THE IGNITION PHASE OF THE ELECTRODELESS RING DISCHARGE [UNTERSUCHUNGEN ZUM ZUENDSTADIUM DER ELEKTRODENLOSEN RINGENTLADUNG]
Edgar Geissler Aug. 1970 106 p refs In GERMAN
(JUL-691-PP) Avail: AEC Depository Libraries

The ignition behavior of the electrodeless ring discharge was investigated in the homogeneous periodically oscillating magnetic field. The commonly perturbing potential fields can be suppressed by an electrolyte. Since sensitive current measurements are not possible in the ring discharge, time-resolved measurements of the density rise were made with a microwave interferometer. NSA

N71-30494*# Georgia Inst. of Tech., Atlanta.
MEASUREMENTS OF THE EXTINCTION PARAMETERS OF HOT SEEDED HYDROGEN AT HIGH PRESSURES
J. R. Williams, W. L. Partain, and J. D. Clement Washington NASA Jul. 1971 37 p refs
(Grant NGR-11-002-068)
(NASA-CR-1864) Avail: NTIS CSCL 20M

Measurements of the extinction parameter of tungsten-hydrogen aerosols were made as a function of wavelength from 2500 A to 5800 A at pressures from 1 to 115 atmospheres and temperatures from 300 K to 2500 K. The measured extinction parameter at room temperature corresponded closely, over this pressure range, to the value of the extinction parameter calculated using the Mie theory. At 1 atmosphere the extinction parameter of a well dispersed tungsten aerosol increased from 18,000 square centimeters/gm at room temperature to 30,000 square centimeters/gm at 2000 K. At 100 atmospheres, the extinction parameter of a less well dispersed tungsten aerosol increased from 8,000 square centimeters/gm at room temperature to 120,000 square centimeters/gm at 2300 K. The opacity of tungsten-seeded hydrogen at temperatures of about 2000 K or more was shown to be much greater at high pressures than at one atmosphere pressure. Author

N71-30648*# Louisiana State Univ., Baton Rouge. Dept. of Mechanical, Aerospace and Industrial Engineering.
THERMAL SCALE MODELING OF A SPACECRAFT

RADIATOR WITH COUPLED FORCED CONVECTION-CONDUCTION-RADIATION HEAT TRANSFER Annual Report

David P. Colvin (Ph.D. Thesis) and Dupree Maples 1971 225 p refs

(Grant NGR-19-001-068)

(NASA-CR-119280; AR-2) Avail: NTIS CSCL 20M

A thermal model of a spacecraft radiator has been designed and tested. The unique feature of this model is that all three modes of heat transfer – forced convection, conduction, and radiation – are utilized simultaneously under steady-state conditions. A fluid is forced under pressure using similar flow conditions through both prototype and model which are suspended within a cryogenic vacuum chamber. Heat is transferred from the fluid to the tube's inside wall, which then conducts the energy to its outer surface where it is radiated to the surrounding shell that is maintained at a cryogenic temperature with liquid nitrogen. Author

N71-30738*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AXIAL AND CIRCUMFERENTIAL VARIATIONS OF HOT-GAS-SIDE HEAT-TRANSFER RATES IN A HYDROGEN-OXYGEN ROCKET

Ralph L. Schacht and Richard J. Quentmeyer Washington Jul. 1971 30 p refs

(NASA-TN-D-6396; E-5762) Avail: NTIS CSCL 20M

An experimental investigation was conducted to determine the axial and circumferential variations of heat transfer coefficients in two rocket thrust chambers. Heat transfer rates were determined from transient temperature measurements at 20 locations in one thrust chamber and at 18 locations in another thrust chamber. The maximum circumferential variation of C in the chamber and throat are 38 and 27 percent, respectively, when the reference Reynolds number sub d was used in the correlating equation reference Stanton number times the reference Prandtl number to the 0.7 power equals the constant, C, times the reference Reynolds number sub d to the minus 0.2 power. A satisfactory correlation was obtained for all stations when x was used as the characteristic dimension in the Reynolds number, with C equal to 0.0215. The standard deviation of C was 0.0038. Author

N71-30851*# National Aeronautics and Space Administration, Washington, D.C.

THERMAL INSULATION: A COMPILATION

1970 14 p refs

(NASA-SP-5930(01)) Avail: NTIS CSCL 20M

Brief reports on insulation materials and techniques developed for the aerospace industry are presented for possible utilization in other areas. Cryogenic insulation research and design considerations are described and thermal conductivity measurements are mentioned. Protective coatings for components in high temperature environments, and specialized insulation systems are discussed. N.E.N.

N71-30882# Chalmers Univ. of Technology, Goteborg (Sweden). Div. of Solid Mechanics.

THE THERMOELASTIC PROBLEM FOR THE HALF-SPACE

Gustaf Lundberg and Ingrid Granstam, ed. 1970 20 p refs

(PB-197273; CUT-AAV-41; CUT-329) Avail: NTIS CSCL 20L

The expressions for the state of stress and displacement for a half space, in case of thermal stationarity and no surface tractions, are deduced from the general basic formulas for three dimensional thermoelastic problems. In addition the case of rotational symmetry for an entirely arbitrary temperature distribution for the half space with no surface tractions is solved. Author (GRA)

N71-30941*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL RADIATION HEAT TRANSFER. VOLUME 3: RADIATION TRANSFER WITH ABSORBING, EMITTING, AND SCATTERING MEDIA

Robert Siegel and John R. Howell Washington 1971 362 p refs

(NASA-SP-164) Avail: SOD $1.75; NTIS CSCL 20M

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7. ENERGY TRANSFER BY RADIATION COMBINED WITH CONDUCTION AND/OR CONVECTION p 241–275 refs (See N71-30948 18-33)

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N71-30943*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE EQUATIONS OF TRANSFER FOR AN ABSORBING-EMITTING GAS

In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 37–59 refs (See N71-30941 18-33)

Avail: SOD $1.75; NTIS CSCL 20M

The absorption, scattering, and emission effects along a path of thermal radiation are combined to develop the equation of heat transfer. The solution of this equation gives the intensity within the medium. The intensity is then used to obtain energy fluxes that are in turn related to the local temperature within the medium by means of the energy conservation equation. This method provides the necessary relations to obtain energy transfers and temperature distributions in the medium. Author

N71-30944*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

APPROXIMATE SOLUTIONS OF THE EQUATION OF TRANSFER

In its Thermal Radistion Heat Transfer, Vol. 3 1971 p 61–112 refs (See N71-30941 18-33)

Avail: SOD $1.75; NTIS CSCL 20M

Various approximative techniques for solving heat transfer equations are given; a very important one being the diffusion equation. The boundary conditions and application of the diffusion method are considered in detail. Author

N71-30945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN INTRODUCTION TO THE MICROSCOPIC BASIS FOR RADIATION IN GASES AND GAS PROPERTIES

In its Thermal Radiation Heat Transfer Vol. 3 1971 p 113–155 refs (See N71-30941 18-33)

Avail: SOD $1.75; NTIS CSCL 20M

Gas radiation properties vary considerable with wavelength. Some of the fundamentals of the radiative properties are discussed. These include line broadening mechanisms and band absorption correlations. Author

N71-30946*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE ENGINEERING TREATMENT OF GAS RADIATION IN ENCLOSURES
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 157-220 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 20M

Radiation from a gas that is well mixed so that it is isothermal is considered. The method of analyzing heat transfer in a gas filled enclosure is developed by extending the net radiation method for enclosures containing a nonabsorbing medium. The concept of radiative mean beam length is derived for use in gas energy exchange. Author

N71-30948*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENERGY TRANSFER BY RADIATION COMBINED WITH CONDUCTION AND/OR CONVECTION
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 241-275 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 20M

Heat conduction and/or convection occurring simultaneously with radiation in an absorbing-emitting medium requires a distributed energy term source and a nonlinear integrodifferential equation results. The source (or sink) term is the local net radiation gain (or loss) within the medium. The radiative source term is determined by either exact or approximative methods. Analyses are presented where exact, diffusion, additive, and optically thin formulations are used in writing the basic equations describing the physical processes of multimode radiative energy transfer. G.G.

N71-30949*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIATIVE TRANSFER IN SCATTERING AND ABSORBING MEDIA
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 277-312 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 20M

The extinction coefficient for thermal radiation is composed of an absorption coefficient and a scattering coefficient. The equation of transfer when only absorption is present is extended to treating radiative transfer for cases where the scattering phenomenon becomes important. The elastic scattering processes are considered that are important insofar as radiative transfer calculations are concerned. Effects of polarization and the various inelastic scattering processes are only briefly mentioned. Author

N71-30950*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME SPECIALIZED EFFECTS IN ABSORBING-RADIATING MEDIA
In its Thermal Radiation Heat Transfer, Vol. 3 1971 p 313-356 refs (See N71-30941 18-33)
Avail: SOD $1.75; NTIS CSCL 20M

Four special radiation topics, each of which has important applications but in restricted areas, are considered. The first topic deals with media having a nonunity refractive index and includes the radiation within, and penetrating into, materials such as glass and ice. When radiation from one material enters one of another refractive index, the bending and reflection of rays at the intersection are considered. The second topic is flames, both nonluminous and those containing luminous particles, mainly soot. When soot is present and the flame thereby becomes luminous, the radiation is dependent on the radiative properties of the soot and the soot concentration within the flame. Briefly discussed are also luminescence and transient gas radiation problems. Author

N71-31132# Council for Scientific and Industrial Research, Pretoria (South Africa).
MEAN TEMPERATURE DIFFERENCE FOR CROSS FLOW IN A TUBE BUNDLE HEAT EXCHANGER [MITTLERE TEMPERATURDIFFERENZ BEI KREUZSTROM IN EINEM ROHRBUENDEL-WAERMETAUSCHER]
W. Roetzel 1970 18 p refs Transl. into ENGLISH from Brennst-Waerme-Kraft (West Germany), v. 21, no. 5, 1969 p 246-250
Avail: NTIS

In operating tube bundle heat exchangers using cross flow, the mean temperature difference depends on the number of tube rows. The temperature difference increases with increasing number of tube rows from the smallest value for one tube row to a maximum value for pure cross flow. A difference method and a simple approximation procedure for computing the mean temperature difference for cross flow using an arbitrary number of tube rows are described. The results of both methods agree well. Author

N71-31179*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ENTRY GASDYNAMIC HEATING: SPACE VEHICLE DESIGN CRITERIA
Washington Jan. 1971 60 p refs
(NASA-SP-8062) Avail: NTIS CSCL 20M

The criteria for the adequate determination of heat transfer to space vehicles entering planetary atmospheres were studied for the proper selection and design of vehicle shape, structure, and thermal protection. The current techniques are reviewed, and the recommended practices in design input, flow-field determination, convective heat transfer, and uncertainty analysis are presented. F.O.S.

N71-31183*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
HALF-SINE WAVE PULSE FIRING OF ELECTROEXPLOSIVE DEVICES
L. A. Rosenthal (Rutgers Univ.) and V. J. Menichelli 15 Jul. 1971 17 p refs
(Contract NAS7-100)
(NASA-CR-119320; JPL-TR-32-1534) Avail: NTIS CSCL 19A

An apparatus based on the use of a half-sine wave current pulse for electroexplosive device firing is presented. Energy for adiabatic firing can be readily measured. Theory and equations of energy transfer are developed. The application to measurements on certain insensitive electroexplosive devices is presented as an example of capabilities. Author

N71-31243*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF PRIMARY-ZONE SMOKE CONCENTRATIONS FROM SPECTRAL RADIANCE MEASUREMENTS IN GAS TURBINE COMBUSTORS
Carl T. Norgren Washington Jul. 1971 47 p refs
(NASA-TN-D-6410; E-6083) Avail: NTIS CSCL 20M

The smoke concentration within the primary zone of an experimental combustor operating at pressures up to 20 atmospheres was determined with a technique using spectral radiance measurements. Exhaust smoke concentration was obtained from reflectance readings of stained filter paper. The primary zone smoke concentration was of the order of 100 to 1000 times greater than at the exhaust. The smoke oxidation rate obtained is compared with reported values for coal particles and seeded laboratory flames. Primary zone smoke concentration was shown to be related to exhaust smoke number and total radience. Author

N71-31362 Georgia Inst. of Tech., Atlanta.
TRANSIENT FILM BOILING IN A HORIZONTAL ANNULUS FILLED WITH A SATURATED LIQUID
Everett Lyle Richards (Ph.D. Thesis) 1969 145 p

Avail: Univ. Microfilms Order No. 70-3336

An analytical and experimental investigation was conducted to determine the transient film growth during the initial ten milliseconds of transient film boiling in a horizontal annulus. The annulus was filled with nearly saturated static water; heating was from the inner surface and the annulus was open at both ends. The inner surface of the annulus was formed by the heater element which was a resistance heated platinum wire. Nineteen successful experiments were run covering a range of excess temperatures from 1208 to 1792 degrees Fahrenheit. Vigorous nucleate boiling occurred during the initial millisecond of each run. The analytical solution used the continuity, momentum, and energy equations and assumed that no heat was absorbed by the liquid. Solutions to the momentum equations were found for both phases and the results were matched at the interface. The solutions of the momentum and energy equations were programmed for a Univac 1108 digital computer and the results were used to obtain a mass balance on both the liquid and the vapor. Dissert. Abstr.

N71-31386 California Univ., San Diego.
COMBUSTION OF CELLULOSE
Franklin Julian Kosdon (Ph.D. Thesis) 1970 201 p
Avail: Univ. Microfilms Order No. 70-17282

The conditions under which fire will spread from a burning fuel element to an adjacent combustible were investigated. The combustion of a special class of fuel elements, small vertically oriented, cellulosic cylinders of circular cross section was characterized. Measurements and calculations of energy fluxes from burning elements indicated that gas phase combustion characteristics, specifically gasphase rates of heat transfer (convection and conduction), rates of radiative transfer, rates of mass transfer, flame shapes, and velocity, temperature and chemical concentration distributions, were likely to be of paramount importance in affecting flame spread to noncontiguous elements. Rates of radiative transfer were measured by means of a dual wire platinum resistance radiometer specifically constructed for making the present measurements. Flame heights were measured for both birchwood and alpha cellulose elements. The partial differential conservation equations which describe the flow field in the plume zone were solved by means of a conditionally stable, explicit, finite difference calculation. Dissert. Abstr.

N71-31426*# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
THE INVESTIGATION OF FLAME SPREADING OVER THE SURFACE OF IGNITING SOLID PROPELLANTS Final Summary Report
Richard S. Magee and Robert F. McAlevy, III 31 Mar. 1971 74 p refs
(Grant NGR-31-003-014)
(NASA-CR-111942; ME-RT-70009) Avail: NTIS CSCL 21B

CONTENTS:

1. AN INVESTIGATION OF THE FLAME SPREADING CHARACTERISTICS OF THE ICRPG STANDARD REFERENCE COMPOSITE PROPELLANT AND ITS CONSTITUENTS, PART 1 K. S. Pope (M.S. Thesis) 32 p refs (See N71-31427 18-33)

2. FLAME SPREAD OVER FUEL BEDS: SOLID PHASE ENERGY CONSIDERATIONS, PART 2 F. A. Lastrina, R. S. Magee, and R. F. McAlevy, III 15 p refs (See N71-31428 18-33)

3. THE MECHANISM OF FLAME SPREADING OVER THE SURFACE OF IGNITING, CONDENSED PHASE MATERIALS, PART 3 R. F. McAlevy, III and R. S. Magee 13 p refs (See N71-31429 18-33)

4. FLAME SPREADING OVER THE SURFACE OF IGNITING SOLID ROCKET PROPELLANTS AND PROPELLANT INGREDIENTS, PART 4 R. F. McAlevy, III, R. S. McGee, J. A. Wrubel, and F. A. Horowitz 8 p refs (See N71-31430 18-33)

5. A CRITERION FOR SPACE CAPSULE FIRE HAZARD MINIMIZATION, PART 5 R. F. McAlevy, III and R. S. Magee 2 p refs (See N71-31431 18-31)

N71-31427*# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
AN INVESTIGATION OF THE FLAME SPREADING CHARACTERISTICS OF THE ICRPG STANDARD REFERENCE COMPOSITE PROPELLANT AND ITS CONSTITUENTS, PART 1
Kenneth S. Pope (M.S. Thesis) *In its* The Invest. of Flame Spreading over the Surface of Igniting Solid Propellants 31 Mar. 1971 32 p refs (See N71-31426 18-33)
Avail: NTIS CSCL 21B

The surface flame spreading characteristics of the ICRPG reference composite propellant, composed of ammonium perchlorate (76% by wt.) in a matrix of polyurethane binder (24% by wt.) were investigated. Tests were conducted on both the propellant and its constituents in a pressure vessel, under quiescent conditions, to determine the dependence of the flame spreading velocity on environmental composition and pressure. Small specimens were mounted horizontally in a chamber and ignited by an electrically heated wire placed at one end. The dimensions of the test enclosure were such as to minimize combustion-induced flow and thereby minimize problems associated with convective flow in the environment. It is concluded that the ICRPG propellant flame spreading characteristics cannot directly be related to those of its constituents at this time; but that these characteristics must be studied with the propellant itself. Author

N71-31428*# Stevens Inst. of Tech., Hoboken, N.J. Combustion Lab.
FLAME SPREAD OVER FUEL BEDS: SOLID PHASE ENERGY CONSIDERATIONS, PART 2
F. A. Lastrina, Richard S. Magee, and Robert F. McAlevy, III *In its* The Invest. of Flame Spreading over the Surface of Igniting Solid Propellants 31 Mar. 1971 15 p refs Submitted for publication (See N71-31426 18-33)
Avail: NTIS CSCL 21B

An analytical and experimental investigation of flame spread over the surface of a solid-fuel bed in an oxygen-inert environment is reported. It is postulated that the processes controlling the flame-spreading phenomenon occur in a very small ignition region at the leading edge of the spreading flame adjacent to the surface, and attention is focused on this small region. The solid-phase energy equation is uncoupled from the gas-phase conservation equations and solved separately, retaining as a boundary condition the heat flux into the surface from the adjacent gas phase. The resulting solutions in the form of simple algebraic equations, show clearly the different relationships between the physically important parameters associated with flame propagation over: (1) a thick fuel bed (thermal wave penetration into the solid beneath the ignition region much less than the fuel-bed depth), and (2) a thin fuel bed (subsurface temperature gradients negligible). The critical thickness criterion for separating the regions of thin and thick fuel-bed flame-spreading characteristics evolves as a naturally occurring parameter of the problem. The main dependence of heat flux on environmental parameters is obtained from consideration of the gas-phase conservation equations in a quiescent environment. By combining the results from the gas-phase and solid-phase analyses, simple algebraic relationships are obtained between flame-spreading velocity and parameters of theoretical and practical interest. Author

N71-31429*# Stevens Inst. of Tech., Hoboken, N.J. Combustion Lab.
THE MECHANISM OF FLAME SPREADING OVER THE

SURFACE OF IGNITING, CONDENSED PHASE MATERIALS, PART 3

Robert F. McAlevy, III and Richard S. Magee *In its* The Invest. of Flame Spreading over the Surface of Igniting Solid Propellants 31 Mar. 1971 13 p refs Repr. from 12th Symp. (Intern.) on Combustion Pittsburgh, The Combustion Inst., 1969 p 215-227; see ann. rept., N69-15387

Copyright. Avail: NTIS CSCL 21B

An experimental and theoretical investigation is described of the fundamental mechanism by which a flame spreads over the surface of a condensed-phase material in a quiescent gaseous environment containing a component with which it can react chemically. It is postulated that the advancing flame vaporizes the surface material lying before it. As these vapors diffuse away from the surface, they undergo an exothermic reaction with the chemically active component in the gaseous environment, and ignite; thus, flame spreading is viewed as continuous diffusive, gas-phase ignition. Flame-spreading velocities were measured for a variety of solid materials in O2/inert environments between 4 and 415 psia. Well-defined experimental conditions yielded reproducible results, and thus suggest that flame-spreading velocity is an intrinsic combustion quantity. All data can be correlated by a power-law relationship between the flame-spreading velocity and two gas-phase parameters pressure, and reactive component mole fraction. It is concluded that the velocity is controlled by a gas-phase physical process: probably either heat or mass transfer which supports the mechanism proposed. Author by G.G.

N71-31430*# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.

FLAME SPREADING OVER THE SURFACE OF IGNITING SOLID ROCKET PROPELLANTS AND PROPELLANT INGREDIENTS, PART 4

Robert F. McAlevy, III, Richard S. McGee, John A. Wrubel, and Fred A. Horowitz *In its* The Invest. of Flame Spreading over the Surface of Igniting Solid Propellants 31 Mar. 1971 8 p refs Repr. from AIAA J., v. 5, no. 2, Feb. 1967; see A66-18949 Revised *Its* AIAA 3d Aerospace Sci. Meeting Preprint 66-68-Rev (See N71-31426 18-33)

Copyright. Avail: NTIS CSCL 21B

The velocity at which a flame spreads over the surface of igniting nitrate ester propellants, ammonium perchlorate, and thermoplastics was measured as a function of pressure level and chemical nature of the surrounding, quiescent atmosphere, as well as specimen surface condition. Small test specimens, mounted horizontally, prepared surface upward, in a relatively large test chamber, were ignited and the flame-spreading velocity cinematographically obtained. Flame-spreading velocity was found to vary: directly with pressure level (between 0.1 and 1.0 atm); directly with oxygen fraction of environments composed of oxygen-nitrogen mixtures; and inversely with specimen surface smoothness. For rough-surfaced specimens, photographic evidence of random ignition sites ahead of the spreading flame has been obtained, presumably a result of enhanced radiant heating. A gas-phase model of flame spreading is presented; flame spreading is viewed as a continuous gas-phase ignition process. For smooth-surfaced specimens, an analytical prediction of flame-spreading velocity dependence on gas-phase parameters is supported by the data obtained. Author

N71-31447# Technische Univ., Berlin (West Germany). Fakultaet fuer Maschinenwesen.

CALCULATION OF HEAT TRANSPORT FOR NON-NEWTONIAN LIQUIDS IN LAMINAR PIPEFLOW UNDER CONSIDERATION OF FRICTIONAL POWER [BERECHNUNG DES WAERMETRANSPORTS IN NICHT-NEWTONSCHEN FLUESSIGKEITEN BEI LAMINARER ROHRSTROEMUNG UNTER BERUECKSICHTIGUNG DER REIBUNGSLEISTUNG]

Harald Schueter (Ph.D. Thesis) 1969 199 p refs In GERMAN Avail: NTIS

The non-Newtonian heat transport in laminar pipe flow at differing boundary conditions is analyzed. Considered are frictional loads as well as heat convection and conductivity effects in the fluid that increase its temperature. Energy equations are formed and used to determine that: (1) the heat transfer coefficient between the interior pipe wall and the outer medium remains constant; (2) the heat flow density at the pipe wall remains constant; and (3) the pipe wall temperature changes linear with pipe length. Transl. by G.G.

N71-31450# Technische Univ., Berlin (West Germany). Fakultaet fuer Maschinenwesen.

HEAT TRANSFER IN FLOWS OF PRANDTL-EYRING LIQUIDS THROUGH A LEVEL CRACK CONSIDERING DISSIPATION AND ASYMMETRIC THERMAL BOUNDARY CONDITIONS [WAERMEUEBERGANG BEI DER STROEMUNG VON PRANDTL-EYRING-FLUESSIGKEITEN DURCH EBENE SPALTE MIT BERUECKSICHTIGUNG DER DISSIPATION UND UNSYMMETRISCHER THERMISCHER RANDBEDINGUNGEN]

Albrecht Seifert (Ph.D. Thesis) 1969 98 p refs In GERMAN Avail: NTIS

The heat exchange between the walls of a plane crack and a non-Newtonian fluid flow is calculated by using the Prandtl friction velocity method for determining channel distribution. Heat transfer is described by the temperature field, static heat flow densities, and the median heat flow. Results show that: (1) the heat transfer is most effective if the fluid flow differs from Newtonian behavior at increased pressure loss parameters; (2) nonsymmetrical boundaries produce only effects above the inflow factor of z=0/1. Overall static heat flow densities and median heat flow transfers on both walls are not independent on boundary symmetries; and (3) dissipation effects heat transfer even at small inflow values if the Brinkman number is correspondingly high. Transl. by G.G.

N71-31482*# Shell Development Co., Emeryville, Calif.

HEAT SINK CAPABILITY OF JET A FUEL: HEAT TRANSFER AND COKING STUDIES

L. E. Faith, G. H. Ackerman, and H. T. Henderson Jul. 1971 68 p refs

(Contract NAS3-12432)

(NASA-CR-72951; S-14115) Avail: NTIS CSCL 20M

Experiments were run with Jet A fuel to determine the heat transfer characteristics and coking problems associated with the operation of supersonic turbine aircraft extended by using more heat sink of the fuel for cooling. Selection of the fuel used was based on coker tests of fuels from several sources. Heat transfer to the fuel was studied and correlations were developed for both laminar and turbulent flow of the fuel. Considerable free convection in laminar flow enhanced the heat transfer and stabilized the flow at Reynolds numbers up to 15,000. Tests showed that the tube temperature was the most important variable in determining deposition rate. Coke deposits were found to have two effects on heat transfer, a beneficial effect by acting as a turbulence promoter to increase the convective heat transfer coefficient and a detrimental effect by increasing the resistance to heat transfer. Pressure oscillations in the test section were audible at certain turbulent flow conditions when the exit fuel was near its pseudocritical temperature. Amplitudes ranged up to 350 psi and primary frequencies varied from 1000 to 5000 Hz. Author

N71-31523# Northeastern Univ., Boston, Mass. Dept. of Physics.

VIRIAL EXPANSIONS FOR SUBMONOLAYER HELIUM FILM ADSORPTION

A. Widom and J. B. Sokoloff Apr. 1971 14 p refs

(NUB-2067) Avail: NTIS

The statistical thermodynamics of virial expansions for adsorbed submonolayer helium films are reviewed. Considered is the modification of the localized Langmuir virial coefficients due to quantum tunneling mobility between unoccupied adsorption sites. Experimental implications for adsorption isotherms, heats of adsorption, specific heats, and magnetic susceptibility (for the isotope He3) are discussed. Author

N71-31569# Scott Research Labs., Inc., Plumsteadville, Pa.
A STUDY OF EXHAUST EMISSIONS FROM RECIPROCATING AIRCRAFT POWER PLANTS Final Report
28 Dec. 1970 97 p refs
(Contract CPA-22-69-129)
(PB-197627) Avail: NTIS CSCL 21B

The exhaust emissions of light, piston engine aircraft and the phenomena of natural afterburning of the exhaust gases on contact with the ambient air were investigated. The exhaust emissions of representative aircraft were measured as they were flown in a normal manner. At the same time, the extent of afterburning was measured by sampling the exhaust plume downstream of the exhaust stack and comparing the plume composition, corrected for dilution, to the composition of the stack gases. The exhaust emissions from nine light aircraft were determined using a 9-mode takeoff-cruise-landing (TCL) cycle developed for this study. Exhaust component concentrations and fuel consumption rates were measured for each mode during ten test flights per aircraft. The pollutant concentrations were converted to emission rates per pound of fuel, per minute, per mode, per TCL cycle, and per landing-takeoff (LTO) cycle. Author (GRA)

N71-31570# WADCO Corp., Richland, Wash. Hanford Engineering Development Lab.
TOPLYR: A TWO DIMENSIONAL THERMAL ENERGY TRANSPORT CODE
J. C. Sonnichsen, Jr. and D. C. Kolesar Jan. 1971 41 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-71-39) Avail: NTIS

TOPLYR is a computer code which provides a solution to the partial differential equation describing the convective diffusive flow of thermal energy from a source in an arbitrary flow field. Specifically, TOPLYR computes the temperature distribution in large water bodies resulting from the discharge of condenser coolant water from power plants. The code was designed for analysis in the region commonly described as the drift zone. Taking advantage of the effluents buoyant nature coupled with a small intensity of turbulence in the vertical direction, a two-dimensional model is employed. The exchange of thermal energy at the air-water interface has been accounted for. An alternating-direction implicit algorithm is employed to solve the finite difference equation once the velocity distribution, thermal eddy diffusion coefficients, source strength, and meteorological conditions are supplied. Author

34 GENERAL

Includes information of a broad nature related in industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N71-30522# Royal Swedish Academy of Engineering Sciences, Stockholm.
NATURAL GAS: ENERGY SOURCE AND RAW MATERIAL [NATURGAS: ENERGIBAERARE OCH RAEVARA]
1970 99 p In SWEDISH
(IVA-Medd-167) Avail: NTIS

The results of an analysis of energy sources available in Sweden show that natural gas must be considered as a supplementary raw material source. Cost and environmental problems are investigated taking advantage of experiences already gained in Russia, Europe, and North America. A possible link-up with existing natural gas networks in Russia or Europe and the use of natural gas on an inter-Scandinavian basis is considered. ESRO

N71-30645# Nordforsk, Copenhagen (Denmark).
NORDFORSK'S STUDY OF ENVIRONMENTAL PROBLEMS. COLLABORATION IN POLLUTION QUESTIONS [NORDFORSKS MILJOEVAERDSUTREDNING. SAMARBETE ROERANDE FOERORENINGSFRAEGORNA]
Nils Mustelin and Anders Aekerblom [1969] 110 p refs In DANISH
Avail: NTIS

In studying the possibility of collaboration in Scandinavia in the field of environment pollution, Nordforsk has investigated the present state of affairs in Denmark, Norway, Sweden, and Finland concerning air-, water-, and agricultural pollution (pesticides). The aim of this study is to advise the Scandinavian Council as to the possibility of a common legislation concerning the environment. ESRO

N71-30615# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
AN ITERATIVE BROWSING TECHNIQUE Annual Progress Report, 1 Mar. 1970 - 28 Feb. 1971
John H. Williams, Jr. Apr. 1971 30 p refs
(Contract N00014-70-C-0297)
(AD-722672; APR-1) Avail: NTIS CSCL 5/2

Experience of browsing with a text retrieval system is reported. The technique discussed consists of adding and deleting query terms on successive iterative cycles. The number of hits consistently increased, while the number of false drops consistently decreased on successive cycles. The search system used allows non-Boolean free form query statements. Therefore, an abstract may be used as a query with the objective of finding similar abstracts from the file. Author (GRA)

N71-30639# Royal Swedish Academy of Engineering Sciences, Stockholm.
ARTICLES AND SPEECHES AT THE ANNIVERSARY OF IVA, 1919 - 1969 [AKTUELLA INLAEGG VID ETT JUBILEUM INGENIOERSVETENSKAPSAKADEMIEN, 1919 - 1969]
1969 247 p refs In SWEDISH
Avail: NTIS; Esselte AB, Stockholm: 18 SKR

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10. THE OBJECTIVES AND MEANS OF SOCIETY AND COMMUNITY PLANNING Goeran Sidenbladh p 181-213 refs

11. OREGEOLOGY IN THE FUTURE A. S. Lundberg p 214–221 (See N71-30841 18-13)

12. ENERGY SUPPLY – A KEY AREA IN PROCESS TRANSFORMATION F. Petri p 222–248

N71-30864*# National Aeronautics and Space Administration, Washington, D.C.

MATERIALS HANDLING: A COMPILATION

1970 16 p refs

(NASA-SP-5929(01)) Avail: NTIS CSCL 13H

Brief reports on lifting, moving, and handling operations are presented. Devices to facilitate lifting and transporting equipment under difficult conditions, and materials handling aids are described. N.E.N.

N71-30889*+ National Aeronautics and Space Administration, Washington, D.C.

MANAGEMENT: A CONTINUING LITERATURE SURVEY WITH INDEXES

May 1971 135 p ref

(NASA-SP-7500(05)) Avail: NTIS CSCL 05A

A compilation of references to selected unclassified reports and journal articles on the subject of management is presented. This publication assembles groups of citations previously announced in 1970 in separate journals – Scientific and Technical Aerospace Reports (STAR), International Aerospace Abstracts (IAA), and U.S. Government Research and Development Reports (USGRDR) – together with other reports included in the NASA system but not previously announced. Four earlier issues of this continuing survey have been published. The first issue (NASA SP-7500) covered documents generated or sponsored by NASA from 1962 through 1967; NASA SP-7500 (02) covered documents generated or sponsored by agencies other than NASA in the same time period; NASA SP-7500 (03) covered NASA and non-NASA documents acquired in 1968; and NASA SP-7500 (04) not only covered NASA and non-NASA documents acquired in 1969 but also, like the present supplement, contained a separate section on documents provided by the Defense Documentation Center. The present issue contains 509 references. Author

N71-30940# Society of British Aerospace Companies Ltd., London (England).

INTO THE SEVENTIES: A FUTURE PLAN FOR BRITIAN'S AEROSPACE INDUSTRY

7 Feb. 1969 16 p

Avail: NTIS

An economic appraisal is made of the recent achievements, and it is shown that it is highly important for the national economy that Government-industry cooperation continue and be strengthened. Positive proposals for the future development of the industry are stated with respect to civil aircraft, military aircraft, aircraft engines, guided weapons, aerospace equipment, and space technology. Author

N71-31177# Royal Swedish Academy of Engineering Sciences, Stockholm. Committee for Administrative Rationalization.

ADMINISTRATIVE COOPERATIVE DEVELOPMENT: MANAGEMENT AND OFFICE PRODUCTIVITY IN THE 1970's Final Report [ADMINISTRATIV UTVECKLING UNDER SAMVERKAN: FOERETAGSLEDNING OCH KONTORSPRODUKTION INFOER 70-TALET FULLSTAENDIG RAPPORT]

1970 311 p In SWEDISH

(IVA-23) Avail: NTIS HC $6.00/MF $0.95

The need for an intensified effort in developing effective management and rational office work within industry and the civil service has been studied. The background to this study is specified as: (1) the increased demand for effective management of large organizations and the civil service; (2) the vast and steadily increasing cost of routine office work; (3) the lack of knowledge for solving these problems; and (4) the increase in resources for research on management development and rationalization. ESRO

N71-31278*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

DATA RECEIVED BY WORLD DATA CENTER A FOR ROCKETS AND SATELLITES DURING THE PERIOD 1 JULY–31 DECEMBER 1970

Mar. 1971 132 p refs

(NASA-TM-X-67241) Avail: NTIS CSCL 05B

Rocket discipline codes, scientists and institutions using sounding rockets, launching sites, and meteorological sounding rocket data are summarized along with sounding rocket launchings identified from 1 July to 31 December 1971. Artificial earth satellites and space probes launched for scientific purposes in the same time period are listed as well as reports and reprints which are indexed by subject and country. J.M.

N71-31301# Royal Swedish Academy of Engineering Sciences, Stockholm.

SOVIET QUALITY TECHNIQUES [SOVJETISK KVALITETSTEKNIK]

O. Jonson, R. Enquist, B. Bendelius, I. Frisinger, B. Edenholm et al 1969 51 p refs In SWEDISH

(IVA-14) Avail: NTIS

Scientific research organizations and industries are studying the particular aspects of quality problems. The All-Union Research Institute for Standardization reporting to the Committee for Standards, Measures and Measuring Instruments under the Council of Ministers of the USSR is the interindustry center dealing with the combined analysis of quality. The Institute deals with the development of combined quality control methods for industrial products at their design, prduction, and maintenance stages. It is also occupied with summerizing and evaluating different forms of information about product quality, as well as with developing systems of values and methods of their definition in respect to evaluation and control of quality levels. One of the main functions of the Institute is preparation of technical and normative documentation and effectuation of its expertise. Coordination of research conducted in the USSR in the field of industrial products quality and reliability is also a part of the Institute activities. In the USSR standards specifying requirements for product quality are compulsory. The Research Institute for Standardization effectuates the expertise of all draft standards and directly affects in this way the quality level of industrial and agricultural products. Author (ESRO)

N71-31337# Ohio State Univ., Columbus. Computer and Information Science Research Center.

INFORMATION STRUCTURE AND OPTIMAL POLICY

Yu-ku Li Sep. 1970 22 p refs

(Grant NSF GN-534.1)

(PB-197605; OSU-CISRC-TR-70-2) Avail: NTIS CSCL 12B

A partial effort toward theory development and systematic analysis of the problem of selecting an optimal information structure in the context of decision making is reported, with emphasis on a stochastic environment is reported. It was demonstrated that in order to evaluate the information structure in a decision theory framework, the optimal decision rule is directly affected by the probabilistic nature of the message generating process. Author (GRA)

N71-31339# National Bureau of Standards, Washington, D.C.

STANDARD REFERENCE MATERIALS: STANDARD SAMPLES ISSUED IN THE USSR

R. S. Gorozhanina et al Jun. 1971 87 p Transl. into ENGLISH

from the Russian report
(NBS-SP-260-30) Avail: SOD $1.00

Information on standard samples issued in the U.S.S.R. for determining the properties and composition of substances and materials including application, nomenclature, certified characteristics, and values of the certified quantities, is presented in handbook form. Author

N71-31376# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
FIRE FIGHTER'S EXPOSURE STUDY Final Report, Jul. – Nov. 1970
Kenneth W. Graves Dec. 1970 88 p refs
(Contract F33615-70-C-1715)
(AD-722774; CAL-HM-2972-Z-1; AGFSRS-71-2) Avail: NTIS CSCL 13/12

Experimental fires from pools of burning aircraft fuels were instrumented with heat meters to determine heat flux distributions for application to the design of protective clothing for firefighting personnel. The spectral distribution of infrared radiation emitted by fires was also measured. Conditions affecting the fires and the resulting heat effects that were studied were wind velocity, fuel pool area, time of burning, orientation around the fire relative to wind direction, distance from the fire, and an extraneous object in a fire. A means by which evaluation of reflective clothing can be made is described. Author (GRA)

N71-31388# Programmes Analysis Unit, Didcot (England).
AN OUTLINE OF EVALUATION AS PRACTISED BY THE PROGRAMMES ANALYSIS UNIT WITH THREE CASE STUDIES Lectures delivered at the College of Europe
P. M. S. Jones and H. Hunt Nov. 1969 83 p refs Presented at Bruges, Belgium, 9 Sep. 1969
(PAU-M-12) Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

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1. AN OUTLINE OF PROGRAMME EVALUATION AS PRACTICED BY THE PROGRAMMES ANALYSIS UNIT P. M. S. Jones p 1–18 refs (See N71-31389 18-34)
2. SINGLE PROJECT EVALUATION: HYDROSTATIC EXTRUSION, PART A P. M. S. Jones p 19–27 refs (See N71-31390 18-34)
3. PORTFOLIO ANALYSIS, PART B P. M. S. Jones p 28–70 refs (See N71-31391 18-34)
4. SYSTEMS ANALYSIS APPLIED TO MARINE TECHNOLOGY PART C H. Hunt p 71–84 refs (See N71-31392 18-34)

N71-31389# Programmes Analysis Unit, Didcot (England).
AN OUTLINE OF PROGRAMME EVALUATION AS PRACTICED BY THE PROGRAMMES ANALYSIS UNIT
P. M. S. Jones *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 1–18 refs (See N71-31388 18-34)
Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

Methods and techniques used in R and D program evaluation are summarized. Management science and operations research techniques are discussed including cost estimates, cost/benefit analysis, decision making, technology forecasting, dynamic models, the Delphi technique, and market research. J.M.

N71-31390# Programmes Analysis Unit, Didcot (England).
SINGLE PROJECT EVALUATION: HYDROSTATIC EXTRUSION, PART A
P. M. S. Jones *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 19–27 refs (See N71-31388 18-34)
Copyright. Avail: NTIS; HMSO 12s; BIS $2.50

The need for preliminary structuring, the importance of options, the need to consider exploitation routes, the dependence of R and D benefits on lead time, and the significance and treatment of uncertainty and sensitivity analysis in single project evaluation are stressed in an evaluation of a hydrostatic extrusion research program. It is emphasized that the timing of the decision is often critical and the depth of an analysis is frequently dictated not by what is desirable, but by what is practicable within the available time and manpower constraints. J.M.

N71-31391# Programmes Analysis Unit, Didcot (England).
PORTFOLIO ANALYSIS, PART B
P. M. S. Jones *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 28–70 refs (See N71-31388 18-34)
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The problem of either maximizing the return within given resource constraints or deciding on the appropriate level of resource constraint is discussed in a portfolio analysis for investment in an associated group of projects covering a technical area. The importance of non-R and D options, qualitative modeling, and interacting benefits is stressed in a method for defining resource constraints. A mathematical model for the derivation of appropriate investments in R and D is outlined. J.M.

N71-31392# Programmes Analysis Unit, Didcot (England).
SYSTEMS ANALYSIS APPLIED TO MARINE TECHNOLOGY, PART C
H. Hunt *In its* Outline of Evaluation as Practised by the Programmes Analysis Unit with Three Case Studies Nov. 1969 p 71–84 refs (See N71-31388 18-34)
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Techniques used in the application of systems analysis to marine technology in Great Britain are summarized including matrix or tabular methods. Sectorial analyses are discussed for fishing, based on world protein demand forecasts combined with catch estimates for marketing and investments; and marine minerals, based on qualitative and quantitative models of mineral resources in the continental shelf for economic and cost/benefit analyses of mineral extraction methods. J.M.

N71-31416# Council for Scientific and Industrial Research, Pretoria (South Africa).
GRAPHS AND CONSTRAINTS [GRAPHES ET ORDONNANCEMENTS]
B. Roy 1969 14 p refs Transl. into ENGLISH from Rev. Fr. Rech. Operationelle (France), v. 6, 1962 p 323–333
Avail: NTIS

Two approaches to the problems of constraint posed by the construction of large structures were compared. Details of the solutions and mathematical models employed in the potentials method of France and the PERT system of the U.S. were examined. Author

N71-31472# Joint Publications Research Service, Washington, D.C.
PHILOSOPHICAL-METHODOLOGICAL PROBLEMS OF THE SYSTEMS APPROACH
V. A. Lektoroskiy et al 30 Jun. 1971 14 p refs Transl. into ENGLISH from Vopr. Filosofii (USSR), no. 1, 1971 p 146–153
(JPRS-53494) Avail: NTIS

An overview is presented of the systems approach for the analysis of systems-structural objects in modern science. Systems approach is defined as the theoretical discussion of methods and principles of researching objects as systems, and in this sense, is considered to be a special line of development of methodological analysis, oriented toward discovering the means and premises of systems research. The philosophico-methodological problems of the systems approach, as experienced by scientists and related in various publications, are critically interpreted. D.L.G.

N71-31611# Committee on Finance (U. S. Senate).
SKYJACKING
Washington GPO 1970 26 p refs Hearing on H.R. 19444 before Comm. on Finance, 91st Congr., 2d Sess., 6 Oct. 1970
Avail: Comm. on Finance

Senate hearings on the Presidential proposal for financing the Federal anti-skyjacking program are presented. The bill would increase the domestic air passenger ticket tax from 8 to 8.5 percent and the international travel facilities tax for $3 to $5 for a temporary period from October 31, 1970 through July 1, 1972. The cost of guards on airliners would be met out of the airway trust fund established from these revenues. A.C.R.

N71-31612# Civil Aeronautics Board, Washington, D.C.
REMARKS OF JOHN G. ADAMS, MEMBER, CIVIL AERONAUTICS BOARD BEFORE THE WINGS CLUB
Sep. 1970 9 p refs Conf. held at New York, 16 Sep. 1970
Avail: NTIS

Probable trends in U.S. air transportation during the 1970's are discussed, and the financial status of the airline industry during this period is speculated upon. Continued record breaking growth in aircraft production is anticipated, predominantly in wide-bodied jets, such as the Boeing 747. This wholesale movement toward extremely large carriers poses problems in frequency of service to many medium sized cities and may even result in its complete loss. Such a development is likely to lead to expension of short-distance, or commuter runs using somewhat larger capacity aircraft. New strictures on the Civil Aeronautics Board's rate-making procedures are also inevitable in light of the D.C. Court of Appeals decision in Moss vs. the Board. Finally, the controversy over Board awards of new routes should ease if the Board moves cautiously in this area while the industry is attempting to digest both the many existing routes and the significant changes in aircraft design and carrying capacity. A.C.R.

N71-31616*# National Aeronautics and Space Administration, Washington, D.C. Technology Utilization Office.
MANAGEMENT TECHNIQUES: A COMPILATION
1970 21 p
(NASA-SP-5933(01)) Avail: NTIS CSCL 05A

A selection of management techniques is presented in summary form, covering a wide range of efficiency and cost-saving programs. Representative techniques discussed include new management and training concepts; accounting and time-use methods which update costs for any given period; computer checks on engineering and schedule effectiveness; data reduction; automated forms and control; and long range planning of manpower. Author

N71-31620# Committee on Science and Astronautics (U. S. House).
FACILITIES ACQUISITION: NASA
Washington GPO 1971 49 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 1st Sess., No. 6, 18 Jun. 1971
Avail: Subcomm. on NASA Oversight

Comments on NASA's policies and procedures concerning the acquisition of a capital plant are presented. Cost of facilities cycles to forecast R and D needs and R and D and R and P.M. appropriations for facility projects are discussed. Facilities management activities and needs in the future for NASA including the policies and procedures required to implement them are summarized. J.M.

N71-31648*+ California Univ., Berkeley. Space Sciences Lab.
ON COMPARISON AND ADMINISTRATION: A PHILOSOPHICAL DISCOURSE Internal Working Paper No. 1
C. West Churchman May 1971 16 p refs
(Grant NGL-05-003-404)
(NASA-CR-119378) Avail: NTIS CSCL 05A

A philosophical approach to the study of comparative administration is presented. Classical measurement concepts are introduced and evaluated as to their effectiveness in comparison methodology. General theories of administration are discussed in terms of what was considered necessary in the past and what will be required of future administrations. In view of the changing expectations placed on administrations by the public, various courses of strategy for the student of comparative administration are outlined. D.L.G.

N71-31662# Civil Aeronautics Board, Washington, D.C.
REMARKS PREPARED FOR DELIVERY FOR THE HONORABLE SECOR D. BROWNE, CHAIRMAN, CIVIL AERONAUTICS BOARD, BEFORE THE INTERNATIONAL AVIATION CLUB
Sep. 1970 7 p Conf. held at Washington, D.C., 17 Sep. 1970
Avail: NTIS

Procedures to be followed prior to, during, and after a hijacking are recommended. The need for more vigorous and effective prosecution of laws and stiffer sentences is stressed, and a task force of legal specialists traveling from case to case is advocated. The use of an inexpensive system for detecting unusual masses of metal on a passenger or in his luggage is urged. A plan to control the hijack while in progress should be developed and include coordination and training of flight deck personnel and special ground crews. Finally, it is pointed out that the cost of protection should be borne by the entire public and not by the traveler alone. N.E.N.

N71-31664# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT; SPACE, SCIENCE, VETERANS, AND CERTAIN OTHER INDEPENDENT AGENCIES APPROPRIATION BILL 1972
Pastore Washington GPO 1971 36 p refs Rept. to accompany H.R. 9382 presented by Comm. on Appropriations at the 92d Congr., 1st Sess., 15 Jul. 1971 *Its* Calendar No. 257 (Rept-92-264) Avail: US Capitol, Senate Document Room

The Committee's recommendations are presented and discussed. They are compared to 1971 appropriations, 1972 budget estimates, and the House bill. The Commission on Population Growth and the American Future was added to the 1972 considerations. N.E.N.

N71-31678# Technische Hochschule Carola Wilhelmina, Brunswick (West Germany).
AUTOMATED PLANNING, CONTROL, AND COST SUPERVISION IN MANUFACTURING WITH SPECIAL EMPHASIS ON TIME-AMOUNT-SERIES [AUTOMATISIERTE PLANUNG, STEUERUNG UND KOSTENUEBERWACHUNG FUER DIE FERTIGUNG MIT BESONDERER BERUECKSICHTIGUNG VON ZEIT-MENGEN- REIHEN]
Ehrhart Geuss (Ph.D. Thesis) 1970 145 p refs In GERMAN
Avail: NTIS

The automatic control of preliminary planning for manufacturing process by integration of mathematical methods is developed. Typical problems of manufacturing and disposition are considered for: (1) the importance of time-amount series; (2) the mathematical treatment of requirement calculations; (3) the realization of the production process, purchasing positions, and individual manufacturing steps by computer processing; (5) the incorporation of procedures into a material supply organization; and (6) estimation and control of production costs. Transl. by G.G.

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By ROBERT D. HUDSON, MSC, and LEE J. KIEFFER,
National Bureau of Standards

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NASA has had a multifaceted role in the development of vacuum metallurgy as a technology. Most obvious would be the requirements associated with the behavior of materials in the space environment and in the development of alloys, processing of materials, and physical and mechanical testing of refractory and reactive materials. This publication, one in a series of technology utilization reports on the development of a class of high-temperature materials called superalloys, presents the latest techniques in processing superalloys, with special emphasis on vacuum melting and casting. *Paperbound.* 180 pp. For sale by the National Technical Information Service, Springfield, Va. 22151, for $3.00.

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